UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

ENVIRONMENTAL ASSESSMENT:

WILDLIFE DAMAGE MANAGEMENT AT AIRPORTS IN OHIO

FINAL

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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January 2007

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ACRONYMS

ADC	Animal Damage Control (former name of Wildlife Services)
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BASH	Bird Aircraft Strike Hazard
BATF	Bureau of Alcohol, Tobacco, and Firearms
BO	Biological Opinion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAR	Federal Aviation Regulations
FEIS	Final Environmental Impact Statement
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
MBTA	Migratory Bird Treaty Act
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	Notice of Availability
OAC	Ohio Administrative Code
ODA	Ohio Department of Agriculture
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
ODW	Ohio Division of Wildlife
ORC	Ohio Revised Code
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 Introduction

Wildlife causes a variety of problems at airports that can compromise safe aircraft operations. The most significant are the thousands of collisions that occur annually between wildlife and aircraft (Cleary and Dolbeer 1999). There is an average of 6,000 total strikes per year reported at 1,200 airports in the US (Cleary et al. 2004). The number of actual wildlife strikes is likely much higher since an estimated 80% of civil bird strikes go unreported (Cleary et al. 2004). These strikes can result in expensive damage to airplanes and, in the worst instances loss of human life when aircraft crash because of damage caused by collisions with wildlife.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (Leopold 1933, the Wildlife Society 1990, Berryman 1991). Under different acts of Congress (Section 1.8.1.1), the Secretary of Agriculture is authorized to carry out wildlife control programs necessary to protect the Nation's agricultural and other resources. The Secretary has delegated his authority under both the statutes listed below to the Animal and Plant Health Inspection Service (APHIS). Within that agency, the authority resides with the Wildlife Services (WS) program. Federal and State agencies, including the United States Department of Interior, Fish and Wildlife Service (USFWS), the Federal Aviation Administration (FAA), and the Ohio Department of Natural Resources (ODNR), recognize the expertise of WS to address wildlife damage issues.

The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of the USDA, APHIS Animal Damage Control (WS) Program Final Environmental Impact Statement (USDA 1997, Revised). These methods include the alteration of cultural practices as well as habitat and animal behavior modification to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that local populations of the offending species be reduced through lethal methods or reproductive control.

The WS mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

A) Training of wildlife damage management professionals;
B) Development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
C) Collection, evaluation, and dissemination of management information;
D) Cooperative wildlife damage management programs;
E) Informing and educating the public on how to reduce wildlife damage and;
F) Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with wildlife at airports in Ohio.

WS is a cooperatively funded and service-oriented program. Before any operational wildlife damage management is conducted, WS and the land owner/administrator must complete Agreements for Control or WS Work Plans which specify the nature of the problem and the management actions to be conducted. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable Federal, State, and local laws.

Individual actions on the types of sites encompassed by this analysis are categorically excluded under the APHIS

Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). WS has decided to prepare this EA to assist in planning wildlife damage management (WDM) activities and to clearly communicate with the public the analysis of cumulative impacts for a number of issues of concern in relation to alternatives for WS' involvement in the protection property and human health and safety from wildlife at airports in Ohio. This analysis evaluates the potential impacts of WS's current and future WDM actions at all airports in Ohio where WS may be requested to provide assistance.

1.1 Need for Action

1.1.1 Overview of Wildlife Hazards to Aviation

Birds and mammals frequent airports and their environments because these areas contain natural and man-made habitats that provide food, water, shelter and open spaces. Wildlife attraction to and use of food and habitat at airports often conflicts with aviation safety.

Collisions between aircraft and wildlife are a concern throughout the world because they threaten passenger safety (Thorpe 1996), result in lost revenue to airlines and costly repairs to aircraft (Linnell et al. 1996, Robinson 1996), and can erode public confidence in the air transport industry as a whole (Conover et al. 1995). While bird-aircraft strikes that result in human fatalities are rare, the consequences can be catastrophic. The worst strike on record for loss of human lives was in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European starlings (Cleary and Dolbeer 1999). More recently, 24 lives were lost when an E-3B "AWACS" aircraft struck a flock of Canada geese at Elmendorf, Alaska in 1995. It is more common for wildlife-aircraft strikes to result in expensive repairs, flight delays, or aborted aircraft movements than in injury or loss of human life. Wildlife strikes result in millions of dollars in direct and indirect damages annually.

The collision of an animal with aircraft is commonly referred to as a "strike." The definition of a wildlife strike was developed by the Bird Strike Committee Canada and has been endorsed by the International Civil Aviation Organization (ICAO), Bird Strike Committee USA (BSC-USA), Bird Strike Committee Europe (BSCE), the Federal Aviation Administration (FAA), the U.S. Air Force, and most airports throughout the United States (Transport Canada 1994, Cleary and Dolbeer 1999). A bird or mammal strike is deemed to have occurred when:

- A pilot reports striking 1 or more birds or other wildlife;
- Aircraft maintenance personnel identify aircraft damage as having been caused by a wildlife strike;
- Personnel on the ground report seeing an aircraft strike 1 or more birds or other wildlife;
- Bird or other wildlife remains, whether in whole or in part, are found within 200 feet of a runway centerline, unless another reason for the animal's death is identified;
- The animal's presence on the airport had a significant negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, aircraft left pavement area to avoid collision with animal).

A high percentage of bird strikes occur during peak migration periods, but dangerous situations can develop during any season. Aircraft are most vulnerable to bird strikes while at low altitudes, generally related to landing and taking off. Approximately 75% of strikes occur under 600 feet above ground level (AGL) (Cleary et al. 2004), which is why management of the area immediately surrounding taxiways, runways, and runway approaches is important.

During the early days of aviation, when aircraft flew at slower speeds, birds had little difficulty avoiding aircraft. Bird strikes were infrequent, and when they did occur, damage was usually minimal. The first recorded strike occurred on April 3, 1912, during a low level flight near Long Beach, California, and

involved a gull with a model EX Wright Pusher airplane. The impact broke a guy wire, causing a fatal crash.

With the introduction of jet aircraft, bird strikes became a serious threat and more costly problem. The rapid acceleration, increased speeds, and reduced noise of jet turbine and turbo-prop aircraft give birds and other animals far less time to react to approaching aircraft. Longer runways and more complete use of runways by jet aircraft increase the likelihood of strikes. The energy released as a result of a high-speed aircraft/bird collision is tremendous, especially to technologically advanced turbine engines that use lightweight, high speed mechanical parts (Blokpoel 1976). Experts within the USDA, the Federal Aviation Administration (FAA) and the U. S. Air Force (USAF) expect the risk, frequency, and potential severity of wildlife-aircraft collisions to escalate over the next decade. This is due to increased air traffic, quieter 2-engine aircraft replacing three- or four-engine aircraft, and increases in population numbers of wildlife species commonly struck by aircraft. (Cleary et al. 2004, Dolbeer and Eschenfelder 2003).

The FAA is responsible for enacting and enforcing the Federal Aviation Regulations (FAR) and policies to enhance public safety. To ensure compliance with Code of Federal Regulations (CFR) Part 139.337), the FAA requires certificated airports to conduct a wildlife hazard assessment when any of the following events occurs on or near the airport:

(1) An air carrier aircraft experiences multiple wildlife strikes:

(2) An air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means damage or structural failure incurred by an aircraft that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component;

(3) An air carrier aircraft experiences an engine ingestion of wildlife; or

(4) Wildlife of a size, or in numbers, capable of causing an event described in (1), (2), or (3) of this section is observed to have access to any airport flight pattern or aircraft movement area.

The U.S. Department of Agriculture, in cooperation with the FAA, maintains an FAA Wildlife Strike Database (FAA National Wildlife Strike Database, http://wildlife-mitigation.tc.faa.gov). The database contains all reported wildlife strikes to all U.S. civil aircraft and to foreign aircraft carriers experiencing strikes in the U.S. Starting in 2004, information from reported wildlife strikes to military aircraft has also been added to the FAA National Wildlife Strike Database. Over 51,000 strike reports with civil aircraft have been compiled from 1990-2003 (Cleary et al. 2004). In 2003 alone, approximately 6,000 strikes were reported. The USAF reports an average of 4000 bird strikes annually (USAF 2005). Statistics on wildlife strikes in the U.S. are compiled by the FAA using data collected on the FAA form 5200-7, Bird/other Wildlife Strike Report. Based on current strike reports and data from USDA field biologists it is estimated that only 20% of civilian wildlife strikes are reported (Cleary et al. 2004).

1.1.2 Need for Wildlife Damage Management to Protect Property

Airports in Ohio contain a variety of habitats from lakes, rivers, and wetlands to woodlands, native grasslands, croplands, and suburban areas. Although habitats differ from one airport to another they all have one thing in common - the airport environment provides habitat for animals that can cause hazards to aircraft. Wildlife can have adverse impacts on property at airports, such as rodent damage to runway light cables and other electronic safety equipment and bird nests on aircraft and in aircraft engines. The most significant property damage from wildlife at airports are the thousands of collisions that occur annually between wildlife and aircraft (Cleary and Dolbeer 1999). Wildlife strikes result in millions of dollars in direct and indirect damages. It is estimated that wildlife strikes cost the US civil aviation industry $500 million/year (Cleary et al. 2004). In Ohio, reported wildlife strikes have caused over $13 million in damages to civil aviation (FAA National Wildlife Strike Database 2003, http://wildlife-mitigation.tc.faa.gov). Gull strikes in Ohio cost the aviation industry the most amount of money with over $5 million in reported damage between 1990-2002, this was followed by Canada geese with over $2.5

million and red-tailed hawks with over $1 million (Figure 1-1). A total cost for all civil aviation wildlife strikes in Ohio is estimated to be as high as $54 million (Barras and Wright 2002). The future looks no better as current wildlife populations and commercial and military air traffic predict an increasing probability of accidents resulting from wildlife strikes nationwide (Cleary and Dolbeer 1999).

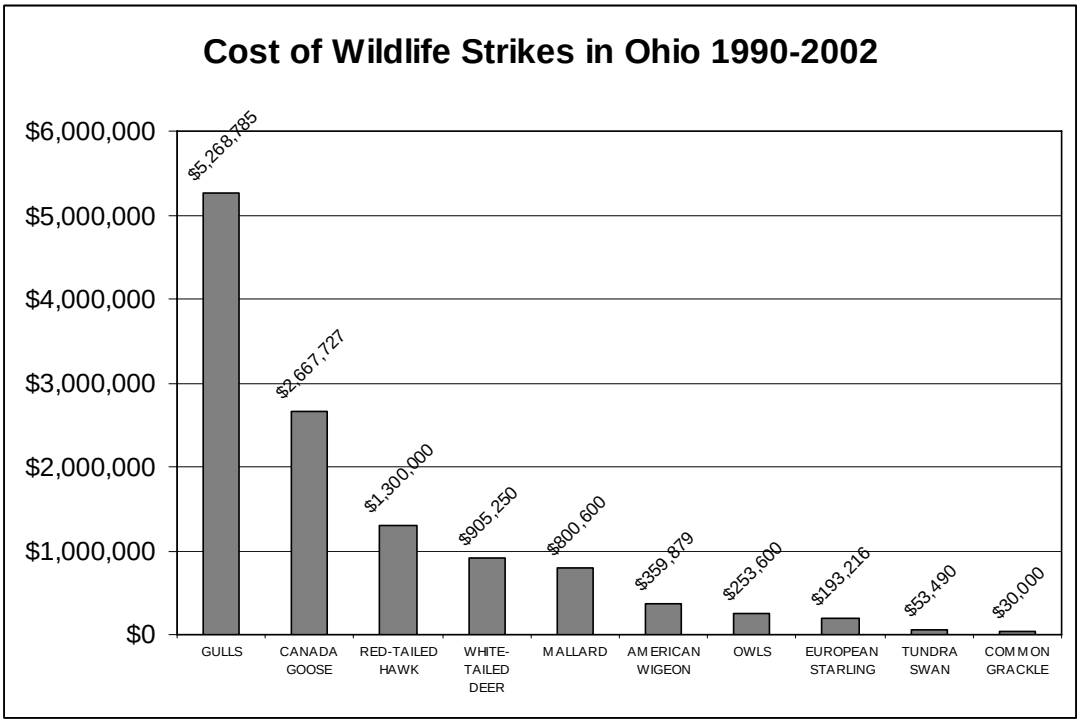

Figure 1-1. Total reported costs resulting from wildlife strikes in Ohio by the top 10 wildlife species/group, 1990-2002.

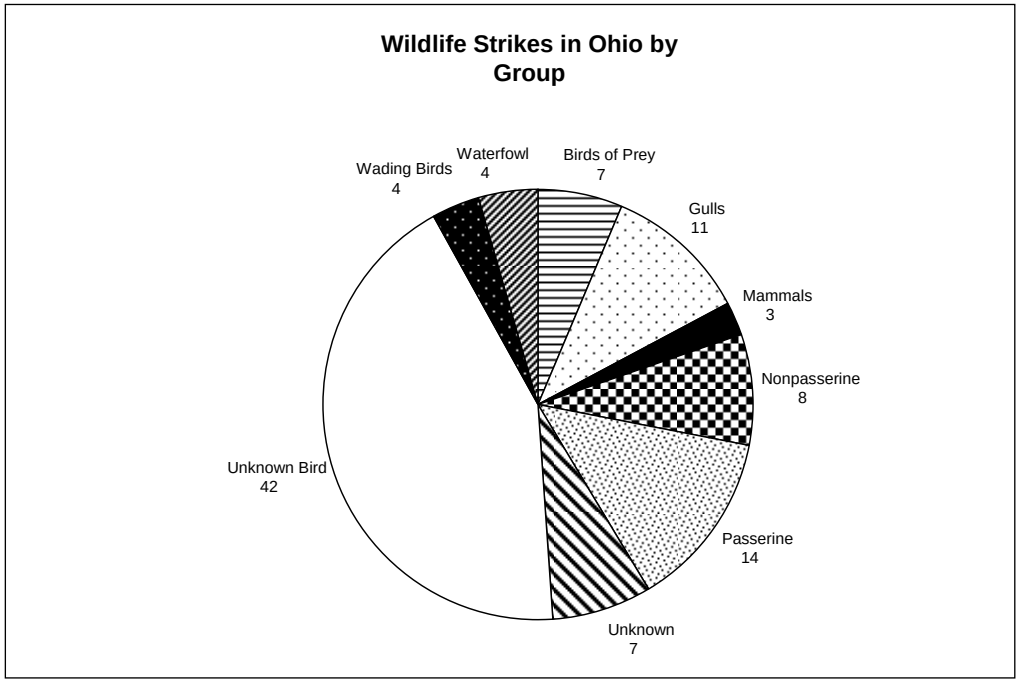

Figure 1-2. Percentage of wildlife strikes in Ohio by group, 1990-2002.

Birds were involved in 97 percent of the reported wildlife strikes in the US between 1990 and 2003, mammals in 2% percent, and reptiles in less than 1% (Cleary et al. 2004). Between 1990 and 2004, 50 Ohio airports have recorded more than 2,300 wildlife strikes (FAA National Wildlife Strike Database 2005, http://wildlife-mitigation.tc.faa.gov). It is important to remember that these figures are probably underestimates of total damage because the FAA estimates that only 20% of wildlife strikes are reported and those that are reported do not always have complete damage information. During the period, 1990-2003, 50 Ohio airports have recorded more than 1800 wildlife strikes involving aircraft; of these 921 had identifiable remains (FAA National Wildlife Strike Database 2003, http://wildlife-mitigation.tc.faa.gov). One thousand six hundred seventy-six of these were bird strikes, and 47 were mammal strikes (FAA National Wildlife Strike Database 2003, http://wildlife-mitigation.tc.faa.gov). Breakdown by group of these wildlife strikes is shown in Figure 1-2.

1.1.2.1 Bird Damage to Property

Birds are a continuous threat to aircraft for the simple fact that they are highly mobile and often prefer the habitat created by an airfield. With this in mind and following the basic laws of physics that no two items can occupy the same space at the same time, a pro-active management should be taken in order to reduce these threats. A single Canada goose strike in Ohio resulted in over $2 million in damage to an aircraft. This is not an isolated incident; of 60 significant wildlife strikes listed in a report to the FAA, 5 occurred in Ohio (Wright 2003). These 5 bird-aircraft collisions reportedly cost over $6.3 million to airlines.

Birds occasionally damage structures on private property or public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on aircraft and automobiles parked at terminals, can occur because of uric acid from bird droppings. Pigeons, starlings and house sparrows sometimes cause structural damage to the inside of hangers and buildings. These birds often roost or nest in the rafters of the buildings where they damage the insulation, and wiring. Also, birds sometime build nests in engines and other compartments of parked aircraft.

1.1.2.2 Mammal Damage to Property

Mammals also pose a serious threat to aircraft. Deer, coyotes, foxes, skunks and raccoons venture onto airfields and become a direct threat to planes both landing and taking off. The FAA strike database reported over 1,100 mammal collisions with civilian aircraft in the U.S. (FAA National Wildlife Strike Database 2003, http://wildlife-mitigation.tc.faa.gov). This resulted in a cost of nearly $30 million to the U.S. civil aviation industry (Cleary et al. 2004)

Between 1990 and 2002 there have been 46 reports of strikes involving aircraft and mammals in Ohio (FAA National Wildlife Strike Database 2003, http://wildlife-mitigation.tc.faa.gov). Of these strikes, white-tailed deer are the most costly to aircraft, resulting in over $900,000 worth of reported damage to aircraft during this period. Damage costs can far exceed this as a recent strike in Alabama in 2001 resulted in the destruction of a Learjet 60 at a cost of $9.5 million (Cleary et al. 2002). Coyotes, skunks and raccoons have each been recorded in at least 5 aircraft strikes for each species in Ohio. Fox, woodchuck, opossum, rabbits and bats have all been involved in aircraft collisions at least once in Ohio. WS has been working at Ohio airports to reduce threats through technical assistance and direct control. Such activities include the recommendation to modify habitat, capture and remove, and use of harassment techniques.

1.1.3 Need for Wildlife Damage Management to Protect Human Health and Safety

Wildlife strikes in Ohio have resulted in a catastrophic accident involving the loss of human life in Ohio (Richardson 1994). In 1981, a military pilot was killed when his aircraft crashed after

striking a bird. There is increased potential for this to occur again in Ohio; as nationwide such accidents have occurred in the past and are occurring with increasing frequency (Cleary and Dolbeer 1999, Cleary et al. 2004). Other risks to human health and safety from wildlife at airports include but are not limited to risk of diseases transmission and injury from aggressive behavior of wildlife.

1.1.3.1 Risks to Human Health and Safety from Mammals at Airports

WS is often contacted and asked to solve problems involving mammal damage issues in relation to human safety. At many airports there is constant risk of a mammal/aircraft strike that could result in human injury or death. For example, white-tailed deer have been ranked as the most hazardous of all wildlife species to aircraft (Dolbeer et al. 2000). Mammal strikes also result in significantly higher percent of aircraft damage than bird strikes (Cleary et al. 2004). WS has been requested to resolve problems such as the removal of mammals from under buildings, in common areas where people work or congregate, and from the airfield. Examples include the removal of skunks from hangers and around buildings; deer that have wandered onto the airfield; woodchucks that are causing damage to buried cable and wiring; and coyotes that have crossed runways and taxiways while foraging for rodents. Another issue of concern that WS has addressed is wild mammal's carrying/transmitting rabies or other zoonotic diseases.

1.1.3.2 Risks to Human Health and Safety from Birds at Airports

Bird/aircraft strikes occur when birds occupy the same space as aircraft. The risk of human injury or fatality is great in these incidents. From 1990-2003 there were 153 human injuries and 9 fatalities reported as a result of bird collisions with civil aircraft in the U.S. (Cleary et al. 2004). There has been no loss of life from civilian aircraft collisions with wildlife in Ohio, however, there was a military fatality from a wildlife strike causing the destruction of a USAF T-38 in 1981 (Richardson 1994). At Ohio airports, bird hazards come in many shapes and sizes. Resident Canada geese often use the grass fields for loafing, feeding and nesting areas. An example where pro-active wildlife management would have saved lives was in September 1995, where a USAF AWACS (E-3) aircraft crashed immediately after take-off at Elmendorf Air Force Base, Alaska, killing all 24 personnel on board (Cleary and Dolbeer 1999). The plane struck a flock of Canada geese that had been seen on a field adjacent to the airfield by a controller, unfortunately the E-3 crew or the Airfield management was not notified.

Many airports have problems with blackbirds (red-winged blackbirds, European starlings, grackles, brown-headed cowbirds, etc.) which have established roosts and staging areas on or near the airfield. These large flocks of birds pose such a risk to aircraft and the health and safety of pilots that flight hours have been restricted during peak bird activity. WS has been requested to resolve problems such as the removal of birds from inside buildings and hangars, in common areas where people work or congregate, and from the airfield. Examples include the removal of starlings from hangers and around loading bridges and geese that were feeding adjacent to an active runway. Another issue of concern that WS has been asked to address is the carrying/transmitting of West Nile Virus by birds.

In addition to the threats to aircraft safety, Ohio airports have requested assistance with the management of feral domestic pigeon and nuisance blackbird or starling roosts. The problems associated with these roosts create disease risks, plus the mess associated with droppings left by concentrations of birds is aesthetically displeasing and results in continual cleanup costs. Feral domestic pigeons and starlings have been suspected in the transmission of 65 different diseases to humans (Davis et al. 1971, and Weber 1979). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, paratyphoid, pasteurellosis, and listeriosis; mycotic (fungal) diseases such as aspergillosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozoal diseases such as American trypansomiasis and toxoplasmosis; and

rickettsial/chlamydial diseases such as chlamydiosis and Q fever. Table 1-1 shows the more typical diseases affecting humans that can be transmitted by pigeons, starlings, and sparrows.

Table 1-1. Information on some diseases transmittable to humans and livestock that are associated with feral domestic pigeons, starlings, and English sparrows-- taken from (Weber 1979).

Disease	Human Symptoms	Potential for Human Fatality	Effects on Domestic Animals
Bacterial:			
Erysipeloid	Skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	Sometimes-particularly in young children, old or infirm people	Serious hazard for the swine industry
Salmonellosis	Gastroenteritis, septicemia, persistent infection	Possible, especially in individuals weakened by other disease or old age	Causes abortions in mature cattle, possible mortality in calves, decrease in milk production in dairy cattle
Pasteurellosis	Respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	Rarely	May fatally affect chickens, turkeys, and other fowl
Listeriosis	Conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	Sometimes-particularly with newborns	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles
Viral:			
Meningitis	Inflammation of membranes, covering the brain, dizziness, and nervous movements	Possible-can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis	Causes middle ear infection in swine, dogs, and cats
Encephalitis (7 forms)	Headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	Mortality rate for eastern equine encephalomyelitis may be around 60%	May cause mental retardation, convulsions, and paralysis
Mycotic (fungal):			
Aspergillosis	Affects lungs and broken skin, toxins poison blood, nerves, and body cells	Not usually	Causes abortions in cattle
Blastomycosis	Weight loss, fever, cough, bloody sputum and chest pains	Rarely	Affects horses, dogs, and cats

Disease	Human Symptoms	Potential for Human Fatality	Effects on Domestic Animals
Candidiasis	Infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	Rarely	Causes mastitis, diarrhea, vaginal discharge and aborted fetuses in cattle
Cryptococcosis	Lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	Possible especially with meningitis	Chronic mastitis in cattle, decreased milk flow, and appetite loss
Histoplasmosis	Pulmonary or respiratory disease; may affect vision	Possible, especially in infants and young children or if disease disseminates to the blood and bone marrow	Actively grows and multiplies in soil and remains active long after birds have departed
Protozoal:			
American trypanosomiasis	Infection of mucous membranes of eyes or nose, swelling	Possible death in 2-4 weeks	Caused by the conenose bug found in pigeons
Toxoplasmosis	Inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	Possible	May cause abortion or still birth in humans, mental retardation
Rickettsial/Chlamydial:			
Chlamydiosis	Pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	Occasionally, restricted to old, weak or those with concurrent diseases	In cattle, may result in abortion, arthritis, conjunctivitis, and enteritis
Q fever	Sudden pneumonitis, chills, fever, weakness, sever sweating, chest pain, severe headaches, and sore eyes	Possible	May cause abortions in sheep and goats

1.2 Purpose

The purpose of this EA is to analyze the potential impacts on the human environment from alternatives for WS involvement in the protection property and human health and safety from wildlife at airports in Ohio. The purpose of the proposed action is to minimize the threat to human health and safety and damage to property caused by wildlife at airports.

Mammal species associated with conflicts at airports may include, but are not necessarily limited to: white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis virginianus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), feral cat (*Felix sp*.), striped skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*), beaver (*Castor canadensis)*, and muskrat (*Ondatra zibethicus*).

Avian species associated with conflicts at airports may include, but are not necessarily limited to: eastern meadow lark (*Sturnella magna)*, horned lark (*Eremophila alpestris)*, killdeer (*Charadrius vociferus)*, Canada goose (*Branta canadensis)*, snow goose (*Chen caerulescens)*, mallard (*Anas platyrhynchos*), other ducks (Anatinae), terns (Sterninae), gulls (Larinae), short-eared owl (*Asio flammeus*), great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), purple finch (*Carpodacous purpureus*), house finch (*Carpodacous mexicanus*) barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), turkey vulture (*Cathartes aura*), blue jay (*Cyabicutta crustata*), eastern bluebird (*Sialia sialis*), northern cardinal (*Cardinalis cardinalis*), upland sandpiper *(Bartramia longicaude*), and common snipe (*Capella gallinago*).

Double-crested cormorants, house sparrows (*Passer domesticus*), European starlings (*Sturnus vulgaris*), red-winged blackbirds (*Agalaius phoenuceus*), brown-headed cowbirds (*Molothrus ater*), rock doves (pigeons, *Columbia livia*), common grackles (*Quiscalus quiscula*) and American crows (*Corvus brachyrhnchos*) may also cause problems at airports. Management of hazards and damage associated with these species has been addressed in other analyses and will not be repeated here (USDA 2003, 2005).

Objectives

To achieve the project's goal of reducing wildlife damage to property and wildlife-related risks to human health and safety, WS has established the following objectives:

- Reduce damaging wildlife strikes to less than 5 strikes per year per airport;
- Reduce and maintain impacts of wildlife activity in hangers to less than $1,000 in damage per year per airport;
- Maintain the runways and airfields at zero down time caused by wildlife.

1.3 Decision to be Made

Based on the scope of this EA, the decisions to be made are:

- How can WS best respond to the need to reduce wildlife damage to property and risks to human health and safety at airports?
- What would be the environmental effects from implementing various alternative strategies?
- Might the implementation of a WS program to reduce wildlife damage and human health and safety risks at airports have significant impacts requiring preparation of an EIS?

1.4 Current WS Involvement in Wildlife Damage Management at Airports

Various services have been and are currently being provided by WS to reduce wildlife hazards at Ohio airports. These services include technical assistance, wildlife hazard assessments, wildlife hazard management plans, and direct assistance. Projected work at Ohio airports includes continuation of current activities: conducting wildlife hazard assessments, developing wildlife hazard management plans, providing technical assistance, and conducting direct control services. Examples of different work that has been conducted are: facilitating required Federal and State permits; recommendations to modify habitat through vegetation management programs, converting croplands on airfields to a monoculture of turf grass, constructing wildlife fences, and installing perch barriers; landscape and architectural consulting; testing new vegetation and perch barrier strategies; and direct control activities. Direct control activities include but are not limited to harassment, capture and relocation programs, nest and egg destruction, and lethal removal.

1.5 Summary of Proposed Action

The proposed action is to continue the current WS program at civil and military airports in Ohio that responds to requests for WS assistance with the protection of property and human health and safety at airports. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet request or needs for resolving conflicts with wildlife affecting the use of the airfield and safe airport operations (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS would include shooting, trapping, toxicants, or euthanasia following live capture by immobilization drugs or trapping. Non-lethal methods used by WS may include habitat alteration, chemical immobilization, repellents, fencing, barriers and deterrents, netting, capture and relocation, and harassment or scaring devices. In many situations, the implementation of non-lethal methods such as habitat alteration, structural modifications, and exclusion-type barriers would be the responsibility of the airport to implement. WDM by WS would be allowed on the airports and adjacent properties, when requested, where a need has been documented and upon completion of an Agreement for Control. All management actions would comply with appropriate Federal, State, and local laws.

1.6 Scope of This Environmental Assessment Analysis

1.6.1 Actions Analyzed

This EA evaluates wildlife damage management by WS to protect property, and human health and safety on civil and military airports in Ohio wherever airports request such management from the WS program.

1.6.2 Period for which this EA is Valid

If it is determined that an EIS is not needed, this EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary pursuant to APHIS NEPA implementation procedures (7 CFR 372.5(c)). This EA will be reviewed each year to ensure that it is complete and still adequately assesses the scope and impacts of WS WDM activities.

1.6.3 Site Specificity

This EA analyzes potential impacts of WS WDM activities that will occur or could occur on civil and military airports and adjacent properties in Ohio. This EA analyzes the potential impacts of such efforts wherever and whenever they might occur. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of wildlife damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual

actions conducted by WS on airports (See USDA 1997 Revised, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.6.4 Public Involvement/Notification

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.7 Relationship of the Environmental Assessment to other Environmental Documents

WS Programmatic Environmental Impact Statement. WS has issued a Final EIS (FEIS) on the national APHIS/WS program (USDA 1997, Revised). Pertinent and current information available in the EIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting the USDA, APHIS, WS Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

Environmental Assessment: Management of Coyote, Red Fox, Feral Dog, Wolf-Hybrid, and Exotic Carnivore Predation on Livestock in the State of Ohio. In 2001, WS completed an EA that analyzes alternatives for managing coyote, red fox, feral dog, wolf-hybrid, and exotic carnivore predation on livestock in the state of Ohio. The scope of the EA is limited to WS actions to reduce predation on livestock. Take of these species for the protection of livestock will be included in the cumulative impact analysis of this EA.

Environmental Assessment: Reducing Pigeon, Starling, Sparrow, Blackbird, and Crow Damage through an Integrated Wildlife Damage Management Program in the State of Ohio. In 2003, WS completed an EA (bird EA) of alternatives for reducing feral pigeon (*Columbia livia*), European starling (*Sturnus vulgaris*), English sparrow (*Passer domesticus)*, blackbird {red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*)}, and American crow (*Corvus brachyrhynchos*) damage to property, agricultural and natural resources, livestock, and public health and safety. Management of these species at airports was included in the need for action of the bird EA and will not be repeated in this analysis.

Environmental Assessment: Reducing Double-crested Cormorant Damage in Ohio. In 2006, WS, the USFWS, and the Ohio Division of Wildlife (ODW) completed an environmental assessment on alternatives for reducing double-crested cormorant damage to aquaculture, property, and natural resources, and cormorant-related risks to human health and safety. Management of DCCOs at airports was included in the need for action in the cormorant EA and will not be included in this analysis.

1.8 Authority and Compliance

1.8.1 Authority of Federal and State Agencies in Wildlife Damage Management on Airports in Ohio

1.8.1.1 WS Legislative Authority

Under different acts of Congress, the Secretary of Agriculture is authorized to carry out wildlife control programs necessary to protect the Nation=s agricultural and other resources. The Secretary has delegated his authority under both the statutes listed below to APHIS. Within that agency, the authority resides with the Wildlife Services program (The Act of March 2, 1931. (7 U.S.C. 426-426b, The Rural Development, Agriculture and Related Agencies Appropriations Act of 1988, Public Law No. 100-202. (7 U.S.C. 426c)

Section 426 (the first section of the Act of March 2, 1931), as amended on October 28, 2000, authorizes the Secretary of Agriculture to A... conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before October 28, 2000.@ Section 426 formerly provided the Secretary of Agriculture with the authority to A... conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory, or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jack rabbits, brown tree snakes, and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, fur-bearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other will [sic] animals; and to conduct campaigns for the destruction or control of such animals: *Provided*, That in carrying out the provisions of this section the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions.@

Under 7 U.S.C. ' 426c, the Secretary of Agriculture is also authorized A... except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under such agreements into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities.@

Under the Act of March 2, 1931, and 7 U.S.C. ' 426c, APHIS may carry out these wildlife control programs itself, or it may enter into cooperative agreements with States, local jurisdictions, individuals and public and private agencies whereby they may fund and assist in carrying out such programs. Id. These laws do not grant any regulatory authority. Therefore, there are no regulations promulgated under these statutes for wildlife services or animal damage control activities.

1.8.1.2 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) is responsible for managing and regulating take of bird species that are listed as migratory under the Migratory Bird Treaty Act (MBTA) and those that are listed as threatened or endangered under the Endangered Species Act. Sections 1.8.2.2 and 1.8.2.3 below describe WS interactions with the USFWS under these two laws.

1.8.1.3 Ohio Department of Natural Resources Legislative Authority

The Ohio Department of Natural Resources, Division of Wildlife is the managing and regulatory agency responsible for wildlife listed in Chapter 1531 and 1533 of the Ohio Revised Code (ORC). The primary statutory authorities include the protection, preservation, propagation, and management of wild animals in Ohio (ORC §1531.04).

1.8.2 Compliance with other Federal Laws

Several other Federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.8.2.1 National Environmental Policy Act

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the National Environmental Policy Act (NEPA) requirement for the proposed action at airports in Ohio. When WS operational assistance is requested by another Federal agency, NEPA compliance is the responsibility of the other Federal agency. However, WS may agree to complete NEPA documentation at the request of the other Federal agency.

1.8.2.2 Endangered Species Act

It is federal policy, under the Endangered Species Act (ESA), that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available" (Sec.7(a)(2)). WS obtained a Biological Opinion (BO) from USFWS in 1992 regarding potential effects of the national WS program on T & E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997 Revised, Appendix F). WS has also completed an Informal Section 7 Consultation with the USFWS regarding the potential impacts of the proposed program on threatened and endangered species in Ohio (Section 4.1.2).

1.8.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended.

The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "*take*" of these species by any entities, except as permitted or authorized by the USFWS. The Migratory Bird Treaty Reform Act of 2004 clarifies the original purpose of the Migratory Bird Treaty Act as pertaining to the conservation and protection of migratory birds native to North America and directs the USFWS to establish a list of bird species found in the United States which are non-native, human-introduced species and therefore not Federally protected under the MBTA. The USFWS has completed this list (F.R. Vol. 70, No 49 12710-12716). Certain species in North America including house sparrows and European starlings are already not protected under the MBTA because neither the species nor their family was listed in the MBTA. All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

1.8.2.4 Federal Insecticide, Fungicide, and Rodenticide Act

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical

methods used or recommended by the WS program at airports in Ohio are registered with and regulated by the EPA and the Ohio Department of Agriculture, and are used by WS in compliance with labeling procedures and requirements.

1.8.2.5 National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. The proposed methods do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Noise associated with WS use of frightening devices at the airport will not contribute appreciably to or exceed levels already associated with aircraft traffic. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties.

1.8.2.6 Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360)

The Federal Food, Drug, and Cosmetic Act places the administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

1.8.2.7 Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.)

The Controlled Substances Act of 1970 requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

1.8.2.8 Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA) and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in rabies management programs. Those requirements are: (1) a valid “veterinarian-client-patient” relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human within the withdrawal period must be identified; the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies has recommended that suitable identification markers include durable ear tags, neck collars, or other external markers that provide unique identification (WWHC *undated*). APHIS-WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

1.8.2.9 Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280).

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to Federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, to identify uses of the area to be regulated by the state, the mechanism (criteria, standards or regulations) for controlling such uses, and broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varies depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity.

Wildlife Services has determined that the proposed action would be consistent with the State's Coastal Zone Management Program. WS received notice that the Ohio Department of Natural Resources, Office of Coastal Management has concurred with this determination on December 18, 2006.

1.8.2.10 Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. It is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

1.8.2.11 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately from environmental health and safety risks for many reasons. Wildlife damage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

1.8.2.12 Executive Order 13112 - Invasive Species

Executive Order 13112 directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm or harm to human health.

1.8.3 Compliance with State Laws

Ohio Nuisance Wild Animal Regulations (Ohio Administrative Code §1501:31-15-03)

The Ohio Administrative Code (OAC §1501:31-15-03, Part A) states that for landowners and tenants:
"It shall be lawful for any person to trap live, non-migratory animals, except white-tailed deer, black bear, or wild turkey when such animals have become a nuisance." Such trapping shall be in accordance with specific provisions. In addition (OAC §1501:31-15-03, Part B):
"*Notwithstanding any other provision in this rule, it shall be lawful for any person applying for and receiving a nuisance wild animal trapping permit, and any person acting under the authority of a nuisance wild animal trapping permit, and possessing an Ohio hunting license and valid Ohio furtakers permit to trap wild animals except, white-tailed deer, wild turkey, black bear, and waterfowl".* Such trapping shall be in accordance with specific provisions. For nuisance white-tailed deer, black bear, and wild turkey (OAC §1501:31-15-03, Part C): *"(1) White-tailed deer, black bear, and wild turkey, which are causing damage or have become a nuisance may be captured or killed by licensed nuisance wild animal trappers or other persons, only after such trappers or other persons have received written permission from the chief of the division of wildlife or his designee. (2) The division of wildlife representative approving a permit for a nuisance wild animal trapper or other person to take, trap or capture white-tailed deer, black bear, or wild turkey may include specific stipulations on that permit under which white-tailed deer, black bear, or wild turkey may be captured or killed. It shall be unlawful for any person to violate any stipulation set forth on their permit…".* For nuisance Canada geese (OAC §1501:31-15-03, Part D): *"Nuisance Canada geese: (1) Canada geese which are causing damage or have become a nuisance may be captured or taken by licensed nuisance wild animal trappers, landowners, or agents of the landowner, only after such landowner where the damage or nuisance is occurring has received a goose damage permit from the chief of the division of wildlife or his designee.(2) The division of wildlife representative approving a goose damage permit for a landowner may include specific stipulations on the permit under which waterfowl may be trapped, captured, or taken. It shall be unlawful for any person to violate any stipulation set forth on their permit…".* For harassing waterfowl (OAC §1501:31-15-03, Part F):
"*Notwithstanding any other provision in this rule, it shall be lawful for persons to harass nuisance waterfowl, destroy nests, and render eggs unviable, after authorization is given by the chief of the division of wildlife, or his designee in a manner approved by the chief."* For nuisance raccoon, opossum, coyote, fox and skunk (OAC §1501:31-15-03, Part G): *"It shall be lawful for a landowner, his agent or tenant to trap or take raccoons, opossums, coyote, fox and skunk which are causing damage, are a nuisance, or are sick in accordance with paragraphs (A) and (B) of this rule".*

CHAPTER 2: ISSUES

2.0 Introduction

Chapter 2 contains a discussion of the issues relevant to the analysis including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences) and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop standard operating procedures (SOPs). Additional description of the affected environments will be incorporated into the discussion of environmental impacts in Chapter 4.

Affected Environment

The affected areas include all private and public airport properties throughout Ohio. Virtually all airports in the state of Ohio contain similar types of habitat such as woodlands, wetlands, grasslands, croplands, and suburban areas. Thus, all airports in Ohio may deal with similar types of hazards caused by wildlife. Airport properties include the aircraft operations area AOA and usually some leased properties, which may involve agriculture, commercial, natural resources, and residential areas. According to the 2003-04 Ohio Airport Directory there are 164 listed commercial airports in Ohio (ODOT 2003), and WS could potentially be called upon to conduct WDM on any of them, including any adjacent properties that are negatively impacting or have the potential to negatively impact airport operations. Any adjacent properties not under airport authority would be dealt with under separate agreements with the landowner/manager.

2.1 Issues

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on Target Wildlife Species Populations
- Effects on Other Wildlife Species Populations, including T&E Species
- Effects of Damage to Property from Wildlife Strikes
- Effects on Human Health and Safety
- Effects on Aesthetics
- Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS

2.2 Issues Addressed in the Analysis of Alternatives

2.2.1 Effects on Target Wildlife Species Populations

One concern for WS and members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA are the mammal and bird species listed in section 1.2. A minimal number of individuals are likely to be killed by WS use of lethal control methods under the proposed action in any one year.

2.2.2 Effects on Non-target Species Populations, including Threatened and Endangered Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage management methods and activities on non-target species, particularly Threatened and Endangered Species (T&E). WS standard operating procedures include measures intended to eliminate or reduce the risk of impacts on non-target species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (BO) for the

nation-wide WS program. For the full context of the BO, see Appendix F of the ADC FEIS (USDA 1997 Revised, Appendix F). On January 17, 2007, WS also completed an informal consultation with the USFWS Ohio Field Office regarding the potential effects on T&E species from the actions proposed in this EA (letter from M. Knapp, PhD, USFWS to T. Baranowski, WS).

2.2.3 Economic Losses to Property as a Result of Wildlife Damage

A major concern by the many airports is the economic impact of wildlife damage to aircraft and other property. These people are concerned as to whether the proposed action or any of the alternatives would reduce such damage to more acceptable levels. Wildlife has and could cause damage to aircraft and property as describe in the need for action.

2.2.4 Effects on Human Health and Safety from WDM Methods

Some individuals may be concerned about potential adverse effects on people from being directly exposed to chemicals used for WDM or exposed to the animals that have died as a result of the chemical use. Depending upon the alternative selected, one of the toxicants that WS may use is DRC-1339[1] which would be primarily used to remove rock doves (feral domestic pigeons), starlings or blackbirds in damage situations. Use of DRC-1339 is regulated by the EPA through FIFRA, the Ohio Pesticide Control Laws, and by WS Directives. Avitrol is another avian toxicant which, as applied by WS, primarily serves as a chemical frightening agent which could be used to address conflicts with (species on label). The chemical bird repellents methyl anthranilate (Rejex-it, Goose Chase, etc.) or anthraquinone (Flight Control) could be used to reduce feeding activity on the airfield. Both methyl anthranilate and anthraquinone are non-lethal and work by causing a negative response to feeding in the treated area. The avian tranquilizer Alpha-Chloralose could be used for live-capturing nuisance waterfowl.

Chemical wildlife damage management techniques may also be considered for managing nuisance mammals. Under the alternatives proposed in this EA, registered rodenticides could be used to manage damaging populations of rodents in both field and structural environments. These rodenticides fall into two basic categories: 1) anticoagulants; and 2) non-anticoagulants (such as Bromethalin, Cholecalciferol, and zinc phosphide). Non-lethal repellents containing fatty acids, putrescent egg solids, other animal proteins like blood meal, capsaicin, denatonium saccharide, and thiram may also be used to reduce feeding activity or structural damage on the airfield.

Other individuals may have concerns that there is a potential for drugs used in animal capture, handling, and euthanasia to cause adverse health effects in humans that hunt and eat the species involved. Among the species to be captured and handled under the proposed action, this issue is expected to only be of concern for wildlife which are hunted and sometimes consumed by people as food. Drugs used in capturing, handling, and euthanizing wildlife for wildlife hazard management purposes include ketamine hydrochloride, xylazine (Rompun), sodium pentobarbitol, Beuthanasia-D, and a mixture of tiletamine and zolazepam (Telazol). Meeting the requirements of the AMDUCA (see section 1.8.2.8) should prevent any significant adverse impacts on human health with regard to this issue. Standard operating procedures relevant to this issue include:

- All drug use in capturing and handling wildlife would be under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and APHIS-WS. As determined on a state-level basis by these veterinary authorities (as allowed by AMDUCA), wildlife hazard management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Ear tagging or

[1] DRC-1339 is only registered for use by WS employees. A similar commercially available product (Starlicide) containing the same active ingredient, but at lower concentrations may also be used.

other marking systems will be used as appropriate to alert hunters and trappers that they should contact state officials before consuming the animal.

- Most animals that receive tranquilizing drugs would be released well before state controlled hunting/trapping seasons which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by humans. In some instances, animals that have received tranquilizing drugs would be euthanized when they are captured within a certain specified time period prior to the legal hunting or trapping season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems.

Some people may be concerned that WS use of firearms, traps, snare, and pyrotechnic scaring devices could cause injuries to people. WS personnel occasionally use traps, snares, rifles and shotguns to remove wildlife that are causing damage. There is some potential fire hazard to airport property from pyrotechnic use.

2.2.5 Impacts on Human Safety from Wildlife Strike Hazards

The concern stated here is that the absence of adequate WDM would result in adverse effects on human health and safety, because bird and mammal strikes on aircraft would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries or loss of human lives from wildlife strikes to aircraft.

2.2.6 Effects on Aesthetics

2.2.6.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. Some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Others are frightened or apprehensive about close proximity of specific wild animals. Consequently, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

Some individual members or groups of wildlife species habituate and learn to live in close proximity to humans. Some people in these situations feed these birds/mammals and/or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or birdhouses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics are truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife

related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public reaction to damage management actions is variable because individual members of the public can have widely different attitudes toward wildlife. Some individuals that are negatively affected by wildlife may support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

The public's ability to view wildlife in a particular area would be more limited if the birds and mammals are removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a damage management action. In addition, the opportunity to view or feed other wildlife would be available if an individual makes the effort to visit local wildlife management areas and other sites with adequate habitat and local populations of the species of interest.

Some people do not believe that individual animals or nuisance bird roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view birds and other wildlife species are lessened by WS non-lethal harassment efforts.

Ohio WS recognizes that all wildlife has aesthetic value and benefit. WS only conducts wildlife damage management at the request of the affected property owner or resource manager. If WS received requests from an individual or official for wildlife damage management, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.2.6.2 Effects on Aesthetic Values of Property Damaged by Wildlife

Airport personnel have expressed concerns of bird roosting in trees and structures and are generally concerned about the negative aesthetic appearance of bird droppings. Another situation on which wildlife damage may affect aesthetic value is woodchucks burrowing into airport grounds and landscaping. Costs associated with property damage include labor and disinfectants to clean/sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property, loss of aesthetic value of flowers, gardens, and lawns where birds are roosting, or visitors irritated by the odor of or of having to walk on fecal droppings.

2.2.7 Humaneness and Animal Welfare Concerns Regarding Methods Used by WS

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if " . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."

Suffering is described as a " . . . highly unpleasant emotional response usually associated with pain and distress." However, suffering " . . . can occur without pain . . ." and " . . . pain can occur without suffering . . . " (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for " . . . little or no suffering where death comes immediately . . . " (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would " . . . probably be causes for pain in other animals . . . " (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since " . . . neither medical or veterinary curricula explicitly address suffering or its relief" (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. The addition of approved chemical capture/euthanasia procedures has allowed WS personnel to meet veterinary humane criteria. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some WDM mechanical methods are used in situations where non-lethal damage management methods are not practical or effective.

Ohio WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Standard Operating Procedures (SOP) used to maximize humaneness are listed in Chapter 3

CHAPTER 3: ALTERNATIVES

3.0 Introduction

This chapter consists of 6 parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action/No Action (Alternative 1), 3) a description of Integrated Wildlife Damage Management, 4) Wildlife damage management methods available for use or recommendation by WS in Ohio, 5) Alternatives considered but not in detail, with rationale, and 6) Standard Operating Procedures (SOPs) for deer damage management.

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), *"Methods of Control*" (USDA 1997 Revised, Appendix J) and the *"Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program"* (USDA 1997 Revised, Appendix P).

Alternatives analyzed in detail are:

Alternative 1 – Integrated Wildlife Damage Management (Proposed Action/ No Action Alternative)
Alternative 2 – Only Non-lethal WDM by WS
Alternative 3 – Only Lethal WDM by WS
Alternative 4 – No WDM by WS

3.1 Description of the Alternatives

3.1.1 Alternative 1 – Integrated Wildlife Damage Management (Proposed Action/ No Action)

The proposed action is to continue the current WS program at civil and military airports in Ohio that respond to requests for WS WDM to protect property and human health and safety at airports. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to resolve conflicts with wildlife affecting the use of the airfield and safe airport operations (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS would include shooting, trapping, toxicants, or euthanasia following live capture by immobilization drugs or trapping. Non-lethal methods used by WS may include habitat alteration, chemical immobilization, repellents, fencing, barriers and deterrents, netting, capture and relocation, and harassment or scaring devices. In many situations, the implementation of non-lethal methods such as habitat alteration, structural modifications, and exclusion-type barriers would be the responsibility of the airport to implement. WS may assist with consultations and forms necessary for the airports to obtain a depredation permit under from the USFWS for the removal of migratory birds. WDM by WS would be allowed on the airports and adjacent properties, when requested and a need has been documented. WS operational assistance will only be initiated after completion of an Agreement for Control or similar document outlining the type (WDM methods) and duration of the WDM to be conducted. All management actions would comply with appropriate Federal, State, and local laws.

3.1.2 Alternative 2 – Only Non-lethal WDM by WS

This alternative would require WS to only provide technical and operational assistance with non-lethal methods to resolve wildlife damage problems. Requests for information regarding lethal management approaches would be referred to ODNR, USFWS, local animal control agencies, or private businesses or organizations. WS would not assist with consultations and forms necessary for the airports to obtain a depredation permit from the USFWS for the removal of migratory birds. Individuals might choose to implement WS' non-lethal recommendations or implement lethal methods or other methods not recommended by WS on their own, contract for WS assistance with the use of non-lethal techniques, use contractual services of private businesses, or take no action. In some cases, management methods employed by others could be contrary to the intended use or in excess of what is necessary.

Currently, DRC-1339 and Alpha-Chloralose are only available for use by WS employees. DEA regulated immobilizing/euthanasia drugs are available only to licensed veterinarians or other authorized users such WS personnel. Therefore, use of these chemicals by private individuals would be illegal. However, Starlicide, a product similar to DRC-1339 and Avitrol are available for use by certified pesticide applicators. Under this alternative, Alpha-Chloralose or other approved capture drugs would be used by WS personnel to capture and relocate wildlife. Appendix B describes a number of non-lethal methods available for use under this alternative.

3.1.3 Alternative 3 – Only Lethal WDM by WS

Under this alternative, WS would only provide technical and operational assistance with lethal WDM methods. Technical assistance would include making recommendations to the USFWS and ODNR regarding the issuance of permits to resource owners to allow them to take wildlife by lethal methods. Requests for information regarding non-lethal management approaches would be referred to ODNR, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS' non-lethal recommendations or implement lethal methods or other methods not recommended by WS on their own, contract for WS assistance with the use of non-lethal techniques, use contractual services of private businesses, or take no action. In some cases, management methods employed by others could be contrary to the intended use or in excess of what is necessary. Appendix B describes a number of lethal methods available for use by WS under this alternative.

3.1.4 Alternative 4 – No WDM by WS

This alternative would eliminate Federal WS involvement in WDM at airports in Ohio. WS would not assist with consultations and forms necessary for the airports to obtain a depredation permit under from the USFWS for the removal of migratory birds. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own WDM without WS input. Requests for information would be referred to ODNR, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS' non-lethal recommendations or implement lethal methods or other methods not recommended by WS on their own, contract for WS assistance with the use of non-lethal techniques, use contractual services of private businesses, or take no action. In some cases, management methods employed by others could be contrary to the intended use or in excess of what is necessary. DRC-1339 and Alpha-Chloralose are only available for use by WS employees. However, Starlicide, a product similar to DRC-1339 and avitrol are available for use by certified pesticide applicators. Therefore, use of these chemicals as well as DEA controlled substances by private individuals would be illegal.

3.2 WDM Strategies and Methodologies Available to WS at Airports in Ohio

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2, and 3 described above. Alternative 4 would terminate both WS technical assistance and operational WDM. A more thorough description of the methods that could be used or recommended by WS is in Appendix B.

3.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[2] manner while minimizing the potentially harmful effects

[2] The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns

on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., restricting flying times), habitat modification (i.e., exclusion), animal behavior modification (i.e., hazing), removal of individual offending animals, reduction of local wildlife populations, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2.1 Technical Assistance Recommendations

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. WS' Personnel use the WS Decision model to select among the alternatives available and develop site-specific management recommendations. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need for action, and the practicality of their application.

Under APHIS NEPA implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

3.2.2.2 Direct Damage Management Assistance

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when Agreements for Control or other comparable instruments provide for WS direct damage management. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides or controlled substances are necessary, or if the problem is complex. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. WS' Personnel use the WS Decision model to select among the alternatives available and develop site-specific management recommendations.

3.2.2.3 Examples of WS Direct Operational and Technical Assistance in WDM at Airports in Ohio

WS has implemented and conducted several projects that provide both Operational and Technical Assistance (TA) at airports in Ohio. Such projects include but are not limited to the problems of white-tailed deer and coyotes on the airfield and runway; European starlings roosting and feeding on the property posing serious risk to aircraft; and waterfowl and raptor (birds of prey) use of the airfield. The following are a few examples:

- WS has provided technical assistance and operational assistance to airports to reduce waterfowl activity on airport property and within critical air space. Combinations of active harassment, habitat modification recommendations, and lethal removal of persistent waterfowl have been used to reduce the risk of bird strikes.
- WS has provided technical assistance to airport operations to reduce deer and coyote activities on airport properties by making recommendations such as modifying the habitat and closing any gaps in the fence around the airfield. WS also monitors for the presence of coyote activity by spotlighting at night. Direct control methods employed by WS include harassment and lethal removal by sharp-shooting and trapping.
- WS has provided technical assistance to airport personnel to reduce starling activities on

airport properties by providing information on habitat and behavior modification, and harassment using multiple techniques. WS has also provided direct control through harassment using propane cannons, pyrotechnics, and lethal reinforcement by shooting.

- WS has provided technical assistance to Ohio airports to reduce raptor activities on airport properties by recommending changes in habitat and harassment techniques. Direct control provided by WS has included harassment by distress calls, pyrotechnics, propane exploders, a capture and relocation program and lethal removal by shooting.

3.2.2 WS Decision-Making

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Appendix C). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.

3.2.3 Wildlife Damage Management Methods Available for Use

3.2.3.1 Non-lethal Methods (See Appendix B for detailed descriptions)

Property owner practices consist primarily of non-lethal preventive methods such as cultural methods[3] and habitat modification but may also include techniques like harassment or the use of pyrotechnics, nest destruction and egg addling/oiling/destruction.

Cultural methods these methods generally involve changing human behavior and the management of the site and affected resources to reduce their vulnerability to wildlife damage.

Habitat/environmental modification is used to attract or repel certain wildlife species by manipulating vegetative cover or landscape.

Animal behavior modification refers to tactics that alter the behavior of wildlife to reduce damages. Some but not all of these tactics include:

- Exclusions such as fencing
- Propane cannons (to scare birds and mammals)
- Pyrotechnics (to scare birds and mammals)
- Distress calls and sound producing devices (to scare birds)
- Visual repellents and scaring tactics

Relocation involves capturing and moving damaging birds and mammals to other areas as directed by ODNR.

[3] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage

Nest destruction is the removal of nests of the target species before eggs or young are in the nest.

Live traps are various types of traps designed to capture birds and mammals alive for relocation or euthanasia. Some examples are: snares (with stops to prevent death of captured animals), leg-hold traps, cage traps, clover traps, decoy traps, nest box traps, mist nets, etc. When used as a non-lethal technique, captured animals are moved to another location approved by ODNR and/or the USFWS as appropriate.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as well-contained bait in small quantities with minimal hazards to pets and humans. Single bread or corn baits containing Alpha-chloralose are fed directly to the target birds. When used as a non-lethal technique, tranquilized birds are moved to another location approved by ODNR and/or the USFWS as appropriate.

Methyl Anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl. It can be applied to turf or surface water or as a fog to repel birds from small areas. It may also become available for use as a livestock feed additive that has bird repellent value.

Anthraquinone (Avery et al. 1997) The chemical bird repellent Flight Control could be used to reduce feeding activity on the airfield. Flight Control is a bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area.

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and lower anxiety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer.

Xylazine is a sedative that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia.

3.2.3.2 Lethal Methods (See Appendix B for detailed descriptions)

Shooting is the practice of selectively removing target species by shooting with an air rifle, pistol, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques.

Snap traps may be used to remove small rodents and may also be modified to remove individual birds such as woodpeckers.

Body grip (e.g. conibear) traps are kill traps designed to cause the quick death of the animal that activates the trap. The Conibear size 330 traps used for beaver are used exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface. Smaller body grip traps, such as the size 110 used for muskrats, can be set either in or out of the water. These traps are used and set according to guidelines set by the ODNR.

Egg addling/oiling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; oiling the eggs with vegetable oil; or directly removing eggs from a nest and destroying them.

Avitrol is an avicide registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. As used by WS, this product functions as a chemical frightening agent by causing distress behavior in the birds that consume treated baits from a mixture of treated

and untreated (1:9) bait. Birds that consume treated bait usually die, but the vast majority of birds are frightened from the site by the distress calls of the affected birds (Johnson and Glahn 1994).

DRC-1339 is an avicide used for population reduction to reduce aircraft damage or strike threats from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for feral domestic pigeon, starling, and blackbird damage management under the current program. Starlicide, a similar product available for use by certified pesticide applicators, may also be used.

Zinc phosphide is a metallic toxicant most often used for rodent management, such as rats, mice, voles, woodchucks and muskrats. It can be used to treat a variety of baits, depending on the species being managed.

Anticoagulant rodenticides are toxicants used to manage rodents around buildings and other structures.

Live traps are various types of traps designed to capture birds and mammals alive for relocation or euthanasia. Some examples are: snares, leg-hold traps, cage traps, clover traps, decoy traps, nest box traps, mist nets, etc. When used as a lethal technique, captured animals are euthanized shooting or one of the euthanasia methods described below.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as well-contained bait in small quantities with minimal hazards to pets and humans. Single bread or corn baits containing Alpha-chloralose are fed directly to the target birds. When used as a lethal technique, tranquilized birds are euthanized using one of the methods described below.

Cervical dislocation is sometimes used to euthanize small rodents and birds that are captured in live traps. AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of rodents, poultry, and of small birds (Beaver et al. 2001).

Carbon dioxide (CO_2) gas is an AVMA approved euthanasia method which is sometimes used to euthanize birds and mammals which are captured in live traps or by chemical immobilization and when relocation is not a feasible option. Live animals are placed in a container or chamber into which CO_2 gas is released. The animals quickly expire after inhaling the gas.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

3.3 Alternatives Considered but not Analyzed in Detail with Rationale

Only Technical Assistance by WS

This alternative would not allow WS operational WDM at airports in Ohio. WS would only provide technical assistance and make recommendations when requested. This alternative has been determined ineffective based upon the unsuccessful attempts by some airport personnel to conduct WDM prior to WS direct control involvement even with technical assistance from WS. The WDM programs implemented by airport personnel prior to WS involvement were unsuccessful in preventing the wildlife strikes that prompted airport management to seek assistance by WS.

3.4 Standard Operating Procedures for Wildlife Damage Management Techniques

The current WS program, nationwide and in Ohio has developed Standard Operating Procedures (SOPs) for its activities that reduce the potential impacts of these actions on the environment. These procedures are discussed in detail in Chapter 5 of the ADC Final EIS (USDA 1997 Revised). Some key SOPs pertinent to the proposed action and alternatives of this EA are listed in Table 3-1:

Table 3-1. Key Wildlife Services Standard Operating Procedures.

Standard Operating Procedure	Alternative 1 – Integrated Wildlife Damage Management	Alternative 2 – Only Non-lethal WDM by WS	Alternative 3 – Only Lethal WDM by WS	Alternative 4 – No WDM by WS
Animal Welfare and Humaneness of Methods used by WS				
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate	X	X	X	
The Decision Model (Slate et al. 1992) is used to identify effective biological and ecologically sound WDM strategies and their impacts.	X	X	X	
Captured non-target animals are relocated unless it is determined by Ohio WS personnel that the animal would not survive	X	X	X	
The use of traps and snares conforms to current laws and regulations administered by ODNR and OH WS policy.	X	X	X	
Chemical immobilization/euthanasia or other euthanasia procedures (e.g., gunshot to the brain) that minimize pain were used to kill captured target species slated for lethal removal and/or to kill captured nontarget species deemed unable to survive if released.	X		X	
Drugs are used according to the Drug Enforcement Agency, FDA, and WS program policies and directives and procedures are followed that minimizes pain.	X	X	X	
The use of newly developed, proven non-lethal methods would be encouraged when appropriate.	X	X		
Safety Concerns Regarding WS WDM Methods				
All pesticides are registered with the EPA and ODA.	X	X	X	

Standard Operating Procedure	Alternative 1 – Integrated Wildlife Damage Management	Alternative 2 – Only Non-lethal WDM by WS	Alternative 3 – Only Lethal WDM by WS	Alternative 4 – No WDM by WS
WS employees would follow all EPA approved label directions.	X	X	X	
All controlled substances are registered with DEA or FDA.	X	X	X	
WS employees would follow approved procedures outlined WS Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs.	X	X	X	
The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, is used to determine WDM strategies.	X	X	X	
WS employees that use pesticides are trained to use each material and are certified to use pesticides under EPA approved certification programs.	X	X	X	
WS employees that use controlled substances are trained to use each material and are certified to use controlled substances under Agency certification program.	X	X	X	
WS employees who use pesticides and controlled substances participate in State approved continuing education to keep abreast of developments and maintain their certifications.	X	X	X	
Pesticide and controlled substance use, storage, and disposal conform to label instruction and other applicable laws and regulations, and Executive Order 12898.	X	X	X	
Material Safety Data Sheets for pesticides and controlled substances are provided to all WS personnel involved with specific WDM activities.	X	X	X	
Concerns about Impacts of WDM on Target Species, Species of Special Concern, and Non-target Species				
WS consulted with the USFWS regarding specific risks associated with the proposed action and will adhere to all recommendations and Reasonable and Prudent measures for the protection of T&E species that may result from that consultation.	X	X	X	
Management actions would be directed toward localized populations or groups and/or individual offending animals.	X	X	X	
WS personnel are trained and experienced to select the most appropriate methods for taking targeted animals and excluding non-target species.	X	X	X	

Standard Operating Procedure	Alternative 1 – Integrated Wildlife Damage Management	Alternative 2 – Only Non-lethal WDM by WS	Alternative 3 – Only Lethal WDM by WS	Alternative 4 – No WDM by WS
WS would initiate formal consultation with the USFWS following any incidental take of T &E species.	X	X	X	
The presence of non-target species is monitored before using toxicants to control rodents, starlings, blackbirds, and pigeons to reduce the risk of significant mortality of non-target species populations.	X		X	
WS take is monitored by comparing the total known number of animals taken (cumulative take) by species or species groups (i.e. blackbirds, raptors) with overall populations or trends in population to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4).	X		X	
WS uses chemical methods for WDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.	X	X	X	

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 Introduction

Chapter 4 provides information needed for making informed decisions when selecting the appropriate alternative for meeting the purpose of the proposed action. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. The proposed action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The environmental consequences of each alternative are compared to the No Action alternative to determine if the real or potential impacts would be greater, lesser, or the same. Therefore the background and baseline information presented in the analysis of the current program alternative thus also applies to the analysis of each of the other alternatives. The No Action Alternative, as defined here, is consistent with the Council on Environmental Quality (CEQ) (1981).

The following resource values within the State of Ohio are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Impacts: Cumulative impacts are discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the National Historic Preservation Act: WS WDM actions are not undertakings that could adversely affect historic resources (See Section 1.8.2.5).

4.1 Environmental Consequences for Issues Analyzed in Detail

4.1.1 Effects on Target Species Populations

4.1.1.1 Alternative 1 – Implement a Federal Wildlife Damage Management Plan (Proposed Action/No Action)

Analysis of this issue is limited primarily to those species most often killed during WS WDM activities. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997 Revised). Magnitude is described in USDA (1997 Revised) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. Table 4-1 shows the numbers of birds and mammals killed by species and methods as a result of WS WDM activities at Ohio airports from FY 2005. WS activities in resolving wildlife damage have been largely non-lethal with many more birds and bird species dispersed by harassment techniques than are killed. Activities conducted by WS at airports in Ohio during FY 2005 were more than 98% non-lethal. The number of animals removed by WS personnel in FY2003 was 1,535, while the number moved by use of harassment with pyrotechnics was estimated at 90,328 (Table 4-2). Under this alternative the number of birds and mammals would likely remain the same or not change substantially from current levels. For comparison, Table 4-3 lists the numbers of animals lethally removed by all sources (i.e. agencies, permits, hunting) in the State of Ohio for 2004.

Table 4-1. Wildlife Lethally Removed by Wildlife Services for Wildlife Damage Management at Ohio Airports in FY 2005.

Species	Damage Management Methods									
	Alpha Chloro-lose	DRC-1339 /Gas Cart.	Body Gripping Trap	Other Trap	Cage Trap	Shooting	Leghold Trap	Egg Destroy /Nest Removal	Snares	Hand Caught
American Kestrel	0	0	0	4	0	1	0	0	0	0
Canada Goose	0	0	0	0	0	44	0	0	0	0
European Starling	0	0	0	8	0	804	0	3	0	1
Feral Cat	0	0	0	0	3	7	0	0	0	0
Herring Gull	0	0	0	0	0	50	0	0	0	0
Mallard	0	0	0	0	0	105	0	3	0	0
Rock Dove (Pigeon)	0	0	0	20	0	45	0	0	0	0
Red-tailed Hawk	0	0	0	0	0	5	0	0	0	0
Ringed-billed Gull	0	0	0	0	0	32	0	0	0	0
Woodchuck	0	21	4	0	0	81	0	0	0	0
Red-winged Blackbird	0	0	0	43	0	220	0	0	0	0
Brown-headed Cowbird	0	0	0	10	0	58	0	0	0	0
Common Grackles	0	0	0	1	0	11	0	0	0	0
Coyote	0	0	0	0	0	3	0	0	4	0
Raccoon	0	0	0	0	0	2	0	0	0	0
Killdeer	0	0	0	0	0	1	0	0	0	0
Rabbit	0	0	0	0	0	3	0	0	0	0
Skunk	0	0	0	0	0	3	0	0	0	0
House Sparrow	0	0	0	0	0	2	0	0	0	0

Table 4-2. Wildlife Harassed and Lethally Removed by Wildlife Services During Wildlife Damage Management Programs at Ohio Airports in FY 2005.

Species	Dispersed/ Freed	Killed
American Crow	26	0
American Kestrel	101	5
Barn Swallow	65	0
Brown-headed Cowbird	530	0
Bonaparte's Gull	366	0
Canada Goose	1605	44
Caspian Tern	160	0
Feral Cats	0	10
Common Grackle	7	12
Coyote	0	8
Ducks, Dabbler, Other	268	0
Double-crested Cormorant	750	0
White-tailed Deer	2	0
Duck, Divers, Other	589	0
European Starling	42413	816
Falcons, Other	10	0
Greater Black-backed Gull	1	0
Great Blue Heron	491	0
Herring Gull	5395	50
House Sparrow	0	2
Killdeer	84	1
Scaup	3865	0
Mallard	2245	108
Woodchucks	0	106
Mourning Dove	765	0
Harriers	2	0
Rabbits	0	3
Raccoons	0	2
Ring-billed Gull	28867	32
Rough-legged Hawk	2	0
Rock Dove (Pigeon)	35	65
Red-tailed Hawk	145	5
Red-winged Black Bird	1305	263
Shorebirds	92	0
Skunks	0	3
Turkey Vulture	52	0
Total	90238	1535

Table 4-3. Wildlife lethally removed or harvested by all sources in the State of Ohio in 2004.

Wildlife Species or Group	OH WS Entire Program	Scientific Collecting Permits	Depredation Permits	Legal Hunting, Trapping	Total	*WS Airport Program Projected Yearly Take*
Canada Goose	119	0	994	96,000	**97,113**	**500**
Great blue heron	5	0	145	0	**150**	**<20**
[1]Beaver	0	0	0	2,057	**2,057**	**100**
Coyote	0	7	0	1,389	**1,396**	**100**
Gray Fox	0	0	0	292	**292**	**100**
Mink	0	0	0	2,454	**2,454**	**100**
Muskrat	0	0	0	65,647	**65,647**	**100**
Opossum	0	0	0	2,428	**2,428**	**100**
Raccoon	0	267	0	83,368	**83,635**	**100**
Red Fox	0	0	0	1,141	**1,141**	**100**
Skunk	0	2	0	238	**240**	**100**
Bonaparte's Gull	0	0	0	0	**0**	**50**
Herring Gull	29	0	27	0	**56**	**50**
Ring-billed Gull	69	0	23	0	**92**	**200**
Killdeer	0	0	10	0	**10**	**100**
Mallard	83	0	126	77,507	**77,716**	**500**
Mourning dove	0	6	3	325,400	**325,409**	**<20**
Mute swan	4	0	0	0	**4**	**<20**
Raptors	0	0	25	0	**25**	**[4]10**
American Kestrel	2	0	0	0	**2**	**25**
Red-tailed Hawk	15	0	0	0	**15**	**10**
White-tailed deer	1	0	5,334	[2]216,443	**221,781****	**100**
Woodchuck		1,009	N/A	N/A	**1,009***	**2,000**

Take reports for 2004 Calendar year unless otherwise noted below.

[1] Fur Trapping season 2004/2005; beaver, coyote, gray fox, red fox, mink, muskrat, raccoon, and skunk.

[2] Deer harvest season 2004/2005

***** Numbers are only estimates because take of blackbird species under the BBDO is not reported, take of exotic species is not regulated and take of certain furbearers requires only that the harvester has a valid state hunting license.

** Not included in this estimate is the 29,874 white-tail deer killed by vehicular collisions on Ohio roadways in 2004.

Breeding Bird Surveys. Bird populations can be monitored by using data from the Breeding Bird Surveys (BBS). The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al 2005). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The BBS was started in 1966, and routes are surveyed in June by experienced birders. The stated primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable annual local habitat and climatic conditions. Trends can be determined using different population equations, and statistically tested to determine if a trend is significant. The statistical significance of a trend's "change" is reflected in the calculated *P*-value (probability) for that species. *P*-values less than or equal to 0.05 are commonly considered statistically significant.

The BBS data is best used to monitor population trends. However, the average number of birds per route (relative abundance) can be used to theoretically estimate the population size (relative

abundance/10 mi^2 x 44,828 mi^2 (total land/water area in Ohio)). To use these population estimates the following assumptions would need to be accepted.

1. All birds within a quarter mile of the observer are seen at all stops on a BBS route; this assumption is faulty because observers often cannot see a quarter mile in radius at all stops due to obstructions such as hills, trees, and brush and because some bird species can be very elusive. Therefore, the number of birds seen per route would provide a conservative estimate of the population.
2. The chosen survey routes are totally random and are fully representative of available habitats. When BBS routes are established, survey rules allow the observers to make stops for surveys based on better quality habitat or convenient parking areas, even though the survey sites are supposed to be spaced a half-mile apart. Therefore, if survey areas had stops with excellent food availability, the count survey could be biased. This would tend to overestimate the population. However, if these sites were not on a route at all, the population could be underestimated.
3. Birds are equally distributed throughout the survey area and routes were randomly selected. Routes are randomly picked throughout the State, but are placed on the nearest available road. Therefore, the starting point is picked for accessibility by vehicle. However a variety of habitat types are typically covered since most BBS routes are selected because they are "off the beaten path" to allow observers to hear birds without interruption from vehicular noise.

Christmas Bird Counts. The National Audubon Society (NAS) conducts nationwide bird surveys in December to early January (the NAS Christmas Counts). The Christmas Bird Counts (CBC) reflect the number of birds frequenting the state during the winter months. The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (National Audubon Society 2002).

Canada Goose Population Effects

Canada geese are a large waterfowl that is found throughout North America. Breeding Bird Survey data from 1980-2005 indicate that this species has been increasing at 4.8%, 12.8% and 6.3% annually in the state, Eastern BBS Region and U.S. respectively ($P \leq 0.04$, Sauer et al. 2005). Canada geese are a widespread occupant of open areas, ponds and wetlands. Their primary diet is vegetative matter and includes items such as grass, corn, and soybeans. Canada geese are also very adaptive to urban settings and often thrive in areas such as public parks and airport retention ponds.

Canada geese are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. Therefore, Canada geese are taken in accordance with applicable state and federal laws and regulations authorizing take of migratory birds; and their nest and eggs, including the USFWS and the ODNR permitting processes. The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on Canada geese populations would have no significant adverse impact on the quality of the human environment.

In recent years, numbers of Canada geese that nest and/or reside predominantly within the conterminous United States (resident Canada geese[iv]) have undergone dramatic growth to levels

[iv] Canada geese nesting within the conterminous United States in the months of March, April, May, or June, or residing within the conterminous United States in the months of April, May, June, July, and August are collectively referred to in the rule as ``resident'' Canada geese.

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that are increasingly coming into conflict with people and causing personal and public property damage. During the period of 2003-05, the total number of resident Canada geese in the United States has averaged approximately 3.34 million birds. This estimate represents an increase in the average of approximately 150,000 geese in the United States from 3.19 million over the period of 2000-2002. The USFWS estimates that over the last six years, U.S. populations of resident Canada geese have increased at an annual growth rate of 1.14 percent.

On August 10, 2006, the USFWS issued a Final Rule on Migratory Bird Hunting and Permits; Regulations for Managing Resident Canada Goose Populations (FR 17:154 pages 45963-45993). The rule was created in response to conflicts associated with high populations of resident Canada geese in the US. The objective of the rule is to allow State wildlife management agencies, private and public landowners, and airports sufficient flexibility to deal with problems, conflicts, and damages caused by resident Canada geese. One component of the USFWS strategy to address conflicts with resident Canada geese was the implementation of a control order authorizing airport managers at commercial, public, and private airports and military air operation facilities to establish and implement a resident Canada goose control and management program when necessary to protect public safety and allow resolution or prevention of airport and military airfield safety threats from resident Canada geese. Control and management activities could include indirect and/or direct control strategies such as trapping and relocation, nest and egg destruction, gosling and adult trapping and culling programs, or other control strategies. The intent of the order alternative is to significantly reduce resident Canada goose populations at airports, where there is a demonstrated threat to human safety and aircraft. Airports and military airfields could conduct management and control activities between April 1 and September 15. The destruction of resident Canada goose nests and eggs could take place between March 1 and June 30. The USFWS would annually assess the overall impact and effectiveness of the management take program on resident Canada goose populations to ensure compatibility with long-term conservation of the resource and its effect on injuries from resident Canada geese. If at any time evidence is presented that clearly demonstrates that a resident Canada goose population no longer needs to be reduced in order to reduce damage and risks to human health and safety, the USFWS would suspend the program for the resident Canada goose population in question. The State would continue to have the legal ability to impose either further State restrictions on the program if they so wish or decline participation of airports in their State.

The state of Ohio monitors populations and sets harvest dates and limits governed by USFWS guidelines. At this time the state agency does not plan to adjust the special goose permitting process in regards to the above-mentioned USFWS Final Rule on Migratory Bird Hunting and Permits; Regulations for Managing Resident Canada Goose Populations (FR 17:154 pages 45963-45993). The Ohio of Division of Wildlife will continue processing and issuing permits as they have always done. The Ohio Division of Wildlife administers special resident goose permits under the authority of the USFWS from March 11-August 31. Persons or entities wishing to manage goose damage during this time will still need to contact the Ohio Division of Wildlife as before.

Moreover, WS recommends that airports suffering damage or threat of damage from Canada geese or any migratory bird obtain a USFWS Depredation Permit so that management of the problem species can be conducted year-round (the depredation order only applies to a portion of the year). The new ruling is not expected to change the mode of operations for Ohio Airports or the recommendations of WS and Ohio Division of Wildlife personnel.

The Ohio Division of Wildlife 2003 spring breeding estimate was 70,498 resident Canada geese with a fall flight of over 100,000 geese. In FY 2005, WS lethally removed 44 Canada geese from OH airports, while harassing 1,605 birds from airfields. Statewide, the Canada goose harvest in 2005 numbered 90,100. Based upon an anticipated increase in future requests for WS assistance at OH airports, WS predicts that no more than 500 geese would be lethally removed annually from airports. Therefore, WS limited take would be < 0.6% of geese taken in the state of Ohio during the hunting season and is < 1% of the estimated spring breeding population. At <1% of the

estimated spring breeding population, this level of take is also less than the number of birds added to the state population each year (6.6% annual population increase, Sauer et al 2005). Therefore, we conclude that the proposed level of take will not have an adverse impact on the Ohio, Eastern BBS Region or U.S. Canada goose population.

Raptor Population Effects

Birds of prey (raptors), such as owls, hawks, falcons, eagles, osprey, and vultures, are hazards to human safety and aircraft operations at airports because of their size, hunting behavior, and hovering/soaring habits (Blokpoel 1976). In spite of the large size and loud noise of incoming and departing aircraft, raptors are generally hesitant to yield aerial territory and therefore are frequently struck (Blokpoel 1976). The combination of abundant food sources, open space, and numerous perching structures on airport grounds and near runway/taxiway areas provides ideal hunting opportunities for many raptors (Blokpoel 1976). In addition to actual bird-aircraft collisions, many raptors are killed by the jet wash associated with large jet aircraft. Ohio is home to a wide variety of raptors, but WS routinely deals with only 2 species as part of its wildlife hazard reduction program at Ohio airports: red-tailed hawks and American kestrels. All raptors are protected by both state and Federal law.

BBS data from Sauer et al. (2005) indicate an increasing breeding population of red-tailed hawks in the state (3.4%/year, $P < 0.01$), eastern BBS region (3.0%/year, $P < 0.01$) and U.S. (1.9%/year, $P < 0.01$). Christmas Bird Count data for 1980-2004 appear to indicate a similar trend for wintering birds. Data on American kestrel indicate relatively stable numbers of breeding birds in the state (-1.3%/year, $P = 0.36$) and eastern BBS region (0.6%/year, $P = 0.34$) and a slightly decreasing numbers of breeding birds in the U.S. (-0.7%/year, $P = 0.07$). Christmas Bird Count information from 1980-2004 indicate a slight decline in winter populations of American kestrels in Ohio and the U.S. (National Audubon Society 2002).

Raptors are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. Therefore, raptors are taken in accordance with applicable state and Federal laws and regulations authorizing take of migratory birds; and their nest and eggs, including the USFWS and the ODNR permitting processes. The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on raptor populations would have no significant adverse impact on the quality of the human environment.

In FY 2005 WS at Ohio airports harassed 258 raptors and lethally removed 5 American kestrels and 5 red-tailed hawks (Table 4-2). Based upon an anticipated increase in future requests for WS assistance at Ohio airports, WS predicts that no more than 25 kestrels and 10 birds/species of any other species of raptor (exclusive of State or Federally listed T&E species) would be lethally removed annually. Therefore, based on the above described population trends, USFWS oversight, and WS limited lethal take of raptors in Ohio, WS should have minimal effects on statewide, regional or national raptor populations.

Mallard Population Effects

Mallards occur across the continent in every U.S. state and Canadian province (Bellrose 1976). Mallards are most common in farmland with numerous ponds, lakes, and slowly flowing, winding streams; in areas with extensive or numerous marshes near extensive grasslands; and in idle and brushy areas dotted with ponds and laced with meandering streams (Hartman 1992). Mallards are also found in urban and suburban areas such as parks, golf courses, natural wetlands, retention ponds and lakes, housing complexes, and industrial parks.

Breeding Bird Survey trend data from 1980-2005 indicate that mallard duck populations have been stable in Ohio and the Eastern BBS Region (1.5%/year, P = 0.48 and 1.3%/year, P = 0.13 respectively) and have increased in the U.S. (2.3%/year, P < 0.01, Sauer et al. 2005). Ohio Christmas Bird Count data from 1980-2005 indicate a relatively stable population of wintering mallards in the state and a stable to decreasing population for the U.S. (National Audubon Society 2002). The 2006 survey of breeding ducks conducted by the USFWS and Canadian Wildlife Services indicated that mallard abundance weas7.3 ± 0.2 million birds which was similar to the 2005 estimate and the long term average for the species (USFWS 2006a). Approximately 59,826 mallards were taken by licensed hunters in 2005 (USFWS 2006b).

Mallard ducks are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. The USFWS, as the agency with management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on mallard duck populations would have no significant adverse impact on the quality of the human environment.

It is anticipated that no more than approximately 500 mallard ducks will be lethally taken on Ohio airports and adjacent properties each year. This is <1% of the 2005 sport harvest reported by the USFWS (2006b). Based on the above population information, hunter harvest data, USFWS oversight, and WS limited lethal take of mallard ducks on Ohio airports and adjacent properties, the WS WDM program should have minimal effects on statewide, regional or continental mallard duck populations. WS take of state protected or state game species is done so only with the permission of and in compliance with regulations enacted by the ODNR, which is the agency given responsibility under Ohio Revised Code 1531.04 to manage wildlife in the State .

Gull (Bonaparte's gull, herring gull, and ring-billed gull) Population Effects

In a continental context, the Region is extremely important for many waterbird species. During the summer months, an estimated 80 - 94% of the global population of Ring-billed Gulls and possibly as much as 60% of the continental population of Herring Gulls breed in the Region, mostly in the Great Lakes.

Gulls are migratory and are commonly found at freshly plowed fields, landfills, airports and near water. These birds are opportunists, finding food scraps in discarded trash from people, worms on runways and taxiways at airports following rains, bugs that are unearthed when fields are plowed and in trash at landfills. Such behavior causes these birds to present considerable hazards to arriving and departing aircraft.

Ohio Christmas Bird Count data from 1980-2004 shows a decreasing trend for Bonaparte's gull in the state and U.S. (National Audubon Society 2002). No Breeding Bird Survey data was available for the Bonaparte's gull. The 2005 draft of the Upper Mississippi Valley Great Lakes Region (UMVGLR) Waterbird Conservation Plan (http://www.fws.gov/birds/waterbirds/umvgl/index.html) classified Bonaparte's gulls as a species of moderate continental conservation concern based on conservation concern scores from Partners in Flight and the North American Waterbird Conservation Plan. The draft UMVGLR plan does not provide a conservation concern rating for Bonaparte's gulls in the Region. Environment Canada ranks the species as very common globally and common in Ontario (http://www.on.ec.gc.ca/wildlife/wildspace/life.cfm?ID=BOGU&Page=More&Lang=e).

Herring gulls are the most widely distributed gulls in the Northern Hemisphere. These gulls breed in colonies near oceans, lakes, or rivers (Bent 1921). Herring gulls nest in all of the Great Lakes and will nest in natural or man-made sites, such as rooftops and breakwalls (Blokpoel and Scharf 1991).

Scharf et al. (1978) reported 29,406 herring gull nests after surveying all nesting areas of colonial waterbirds in the U.S. Great Lakes in 1977. Dolbeer et al. (1990) reported an average annual increase of 11.9% in the number of herring gulls in Lake Erie's Sandusky Bay over a 13-year period. Breeding Bird Survey trend data from 1980-2004 indicate that herring gull populations have been relatively stable in the state (-7.5%/year, P = 0.20), and have decreased in the eastern BBS region (-3.5%/year, P, 0.01) and the U.S. (-1.8%/year, P < 0.01, Sauer et al. 2005). Using BBS data to calculate a population estimate as described above results in an estimated 32,100 herring gulls in the state during the breeding season. Ohio Christmas Bird Count data from1980-2004 shows a decreasing trend for wintering populations of herring gulls in the state and the U.S. (National Audubon Society 2002). The 2005 draft of the Upper Mississippi Valley Great Lakes Region (UMVGLR) Waterbird Conservation Plan (http://www.fws.gov/birds/waterbirds/umvgl/index.html) classified herring gulls as a species of low continental conservation concern based on conservation concern scores from Partners in Flight and the North American Waterbird Conservation Plan. The UMVGLR plan also considers herring gulls to be a low-priority species for conservation concern in the region.

Ring-billed gulls are migratory birds which prefer to nest on islands with sparse vegetation. The breeding population of ring-billed gulls is divided into two populations; the western population and the eastern population. The eastern breeding population of the United States includes New York, Vermont, Ohio, Illinois, Michigan, Wisconsin, and Minnesota (Blokpoel and Tessier 1986). Ring-billed gulls nest in high densities and, in the Great Lakes region, nesting colonies may be located on islands, slag yards, rooftops, breakwalls and landfills (Blokpoel and Tessier 1986). In 1984, the population of ring-billed gulls in the Great Lakes region was estimated at approximately 648,000 pairs (Blokpoel and Tessier 1986). Blokpoel and Tessier (1992) found that the nesting population of ring-billed gulls in the Canadian portion of the lower Great Lakes system increased from 56,000 pairs to 283,000 pairs from 1976-1990. Breeding Bird Survey trend data from 1980-2004 indicate that ring-billed gull populations in the state, eastern BBS region and U.S. have been relatively stable (annual rate of change -1.1 to 1.2%/year, P ≥ 0.27, Sauer et al. 2005). Ohio Christmas Bird Count data from 1980-2004 shows a stable to slightly increasing trend for wintering populations of ring-billed gulls throughout the state (National Audubon Society 2002). The 2005 draft of the Upper Mississippi Valley Great Lakes Region (UMVGLR) Waterbird Conservation Plan (http://www.fws.gov/birds/waterbirds/umvgl/index.html) classified ring-billed gulls "not currently at risk: based on conservation concern scores from Partners in Flight and the North American Waterbird Conservation Plan. The UMVGLR plan also considers ring-billed gulls to not be at risk in the region.

Gulls are protected by the USFWS under the Migratory Bird Treaty Act. Therefore, gulls are taken in accordance with applicable state and Federal laws and regulations authorizing take of migratory birds, and their nests and eggs, including the USFWS permitting processes. The USFWS, as the agency with management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on gull populations would have no significant adverse impact on the quality of the human environment.

It is anticipated that no more than approximately 50 Bonaparte's gulls, 50 herring gulls, and 200 ring-billed gulls will be lethally taken on Ohio airports and adjacent properties each year by Wildlife Services. Based on the above information, USFWS oversight, the fact that WS take would only occur on an extremely small portion of the state and WS limited lethal take of gulls on Ohio airports and adjacent properties, the WS WDM program should have minimal effects on local, statewide, regional or continental Bonaparte's gull, herring gull, and ring-billed gull populations. WS take of state protected or state game species is done so only with the permission of and compliance with regulations enacted by the ODNR, which is the agency given responsibility under Ohio Revised Code 1531.04 to manage wildlife in the State.

Killdeer Population Effects

The killdeer is an upland shorebird with two black bands around its neck. It has a brown back and a white belly. Killdeer are classified as a shorebird, but are actually found in a variety of habitats. They nest in short-grass areas such as meadows, pastures and cultivated field edges but are also found nesting in Ohio in concrete or asphalt parking lots, on airports, and on military ranges. The killdeer is adaptable and also nests on the beaches of Lake Erie, marsh dikes and gravel covered roofs (Peterjohn 2001). The killdeer is a common summer resident throughout Ohio and their population is increasing (Peterjohn 2001).

Data from the BBS indicate that, over the period of 1980-2004, the number of killdeer present during the breeding season has been increasing in the state (1.3%/year, P – 0.03), relatively stable for the eastern BBS region (0.1%/year, P = 0.73) and decreasing slightly for the U.S. (-0.5%/year, P = 0.03, Sauer et al. 2005). Using BBS data, the summer killdeer population in Ohio may be estimated at approximately 61,000 birds. Killdeer are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In FY 2005, WS at Ohio airports removed 1 killdeer and harassed 84 on Ohio airports. Killdeer are frequently seen on Ohio airports and WS assistance may be requested. Based upon an anticipated increase in future requests for WS assistance at OH airports, WS predicts that no more than 100 killdeer would be lethally removed annually. Therefore, WS limited take should have minimal effects on killdeer populations.

White-tailed Deer Population Effects

The ODNR is responsible for the management and monitoring of the state's white-tailed deer. ODNR reports that Ohio's statewide deer population has increased in the last 5 years with an estimated population size of nearly 600,000 (2003-2004 Ohio Wildlife Population Status & Hunting Forecast). This is supported by the Ohio Department of Public Safety's Deer-vehicle accident trends increase from 24,868 in 1998 to 30,306 in 2002 (Summary of 2002-03 Ohio Deer Seasons). White-tailed deer complaints have also increased from 885 in 1999 to 2,221 in 2004 (Summary of 2004-05 Ohio Deer Seasons). WS work at airports in Ohio has resulted in one removal of a white-tailed deer during FY 2004 and no removal of deer during FY 2005. Based upon an anticipated increase in future requests for WS assistance at OH airports, WS predicts that no more than 100 white-tailed deer would be lethally removed annually. This is a minimal number of animals compared to the states 2004-05 harvest 216,443deer (Summary of 2004-05 Ohio Deer Seasons). The ODNR concurs that the action take by WS will not have any negative impacts on the state's deer population (ref. letter requested from ODNR).

Furbearer Population Effects

The ODNR is responsible for the management of the state's furbearer (i.e. raccoon, coyote, fox, beaver, etc.) populations. The Ohio Revised Code (ORC §1501:31-1-02) defines "Furbearing animals" as; minks, weasels, raccoons, skunks, opossums, muskrats, fox, beavers, badgers, otters, coyotes, and bobcats. The Ohio Division of Wildlife uses a Bowhunter Survey to track year-to-year changes in furbearer populations in Ohio, and also monitor the sale of pelts. The statewide population trend for coyotes appears to have leveled off after increases were observed during the 1990's (2003-2004 Ohio Wildlife Population Status & Hunting Forecast). Beaver and gray fox population trends appear to have increased in the last few years, while opossum, red fox and raccoon have generally remained stable for the last 5 years (2003-2004 Ohio Wildlife Population Status & Hunting Forecast). Currently, ODNR has open furbearer hunting seasons that are as follows: fox, raccoon, opossum, skunk, weasel may be hunted from 11/10/03 to 1/31/04; coyote has no closed hunting season and may be hunted year-round. 2003-2004 trapping seasons in Ohio are as follows: fox, raccoon, opossum, skunk, weasel, mink, muskrat, 11/10/03 through 1/31/04 or 2/29/04 or 3/15/04 (depending on zone); beaver, 12/26/03 or 1/10/04 through 2/29/04 (depending on zone); There was no open season on river otter. There are no daily bag or

possession limits. During the 2002-03 fur harvest season, ODNR recorded a total of 108,871 pelts bought by Ohio fur dealers.

During FY 2005 WS took the following species and numbers of furbearers on airports in Ohio; 8 coyotes, 2 raccoons, and 3 striped skunks. Based upon an anticipated increase in future requests for WS assistance at OH airports, WS anticipates that no more than 100 individual furbearers each of those species listed in Section 1.2 (list in Section 1.2 excludes river otter) would be lethally removed annually. With the states liberal harvest regulations, the magnitude of WS take on these species would be minimal.

This is supported by the basic biology of many furbearing species. For example, the muskrat is prolific, and in Ohio most females produce 2 litters annually (Gottschang 1981). Each litter may contain up to 11, and under ideal conditions female muskrats may rear 19 or more young per year (Gottschang 1981).

In 2005 trapping for river otter opened for the first time since their reintroduction into 4 Ohio watersheds in 1986 and 1993. The seasons for river otter are time limited (2 months, Dec. 26, 2005- Feb. 28, 2006) and also limited to certain counties within the state. The eastern 31 of Ohio's 88 counties allow for the trapping of 3 otters, 11 central Ohio counties allow for the trapping of 1 otter, and the remaining 46 western counties are closed entirely to otter trapping. WS impacts to river otter will be little to none since river otter are not likely present on airports and if so they are not likely to present a wildlife strike hazard.

Woodchuck Population Effects

Woodchucks, also commonly referred to as groundhogs, are a large rodent, often seen in pastures, meadows, and fields. They dig large burrows 8-12 inches at the opening, sometimes 5 feet deep and 30 feet long with one or more entrance. Woodchucks have one litter a year that ranges from 2-6 young. The offspring breed at age 1, and live 4-5 years. If a pair of woodchucks and their offspring all survived to breed as soon as possible, with an average litter size of 4 with a 1:1 sex ratio; they could produce over 645 woodchucks through their life time. No population data or density information was available for woodchucks in Ohio.

Woodchucks are found throughout Ohio and are listed as a "game quadruped" in the state of Ohio (ORC §1501:31-1-02). According to the Ohio Revised Code woodchucks may be hunted year-round (ORC §1501:31-15-17). As such there are no closed seasons or bag limits for woodchucks.

It is anticipated that no more than approximately 2,000 woodchucks will be lethally taken on Ohio airports and adjacent properties each year. Based on the above information, that WS' activities would be limited to a small portion of the state, and WS limited lethal take of woodchucks on Ohio airports and adjacent properties, the WS WDM program should have minimal effects on statewide woodchuck populations. With the state's liberal harvest regulations, the magnitude of WS take on these species would be minimal. WS take of state protected or state game species is done so only with the permission of and compliance with regulations enacted by the ODNR, which is the agency given responsibility under Ohio Revised Code 1531.04 to manage wildlife in the State.

Rodent Population Effects

Rodents such as rats, house mice, voles, and native mice are common prey species found on airports, which in turn attract raptors and other predators to the airport environments. Any direct control for such rodents would be done to help prevent raptors and other predators from hunting near runways and taxiways. Impacts to such rodents would be minimal because any rodent management would be localized within the airport perimeters, and is supported by the high reproductive rate of these rodents (Mumford 1984). Additionally, WS would consult with ODNR

before applying rodenticides at airports in order to confirm that no state-listed threatened or endangered rodents would be harmed in the process.

Other Target Species Population Effects

Target species, in addition to those analyzed above, have been removed in small numbers by WS during the past year and have included include no more than 20 individuals of a given species (Table 4-1). Other species that could be removed during WDM activities include any of the species listed in Section 1.2. None of these species are expected to be taken by WS WDM at any level that would adversely affect populations.

4.1.1.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would not lethally take any target species and only non-lethal WDM activities and technical assistance recommendations would be made or implemented. Airport operators have a legal responsibility to exercise "due diligence" in managing wildlife hazards. In some cases the courts have found that airport operators were responsible for damages because they failed to "take the precautions possible", "undertake all measures at its disposal", and/or had ineffective control of bird hazards (Dolbeer 2005). Therefore, it is likely that airport personnel or outside contractors would seek to use lethal WDM techniques. This could lead to similar or greater impacts on target species populations than the current program alternative depending upon the level of training and experience of the personnel conducting the WDM. However, even though take of species may be higher than anticipated for Alternative 1, overall levels of take are not likely to exceed numbers analyzed in Section 4.1.1.1. For the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that target wildlife populations would be adversely affected by implementation of this alternative.

4.1.1.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, WS would likely have a greater impact on the target species population at airports in Ohio than Alternative 1. WS would not recommended or use any non-lethal WDM activities to reduce wildlife damage at such airports. Only lethal WDM activities would be implemented to resolve wildlife damage in all situations. It is likely that a greater number of birds and mammals would likely have to be removed lethally to attempt to achieve the same results as the proposed action, but overall levels of take are not likely to exceed levels analyzed in Section 4.1.1.1. Based upon the information described in section 4.1.1.1, it is unlikely that target species populations would be adversely affected by implementation of this alternative.

4.1.1.4 Alternative 4 – No Federal WS WDM

Under this alternative, WS would have no impact on target species populations at airports in Ohio. As stated in Section 4.1.1.2, airport operators have a legal responsibility to manage wildlife hazards. This will result in increased efforts by airport personnel/contractors to reduce or prevent wildlife conflicts. Impacts on target species under this alternative could be the same, less, or more than those of the proposed action, depending on the level of effort expended by airport personnel/contractors and the degree of experience and training of the individual(s) conducting the work. However, the scope of the removals would be limited to airports and their surroundings, it is unlikely that target wildlife populations would be adversely affected by implementation of this alternative.

4.1.2 Effects on Non-target Species Populations including Threatened and Endangered Species

4.1.2.1 Alternative 1 – Implement a Federal Wildlife Damage Management (Proposed Action/No Action)

Standard operating procedures to avoid non-target and T&E species impacts are described in Chapter 3 (section 3.4.2.2). Additional information on risks to nontarget species is also provided in Appendix B.

Adverse Impacts on Non-target (non-T&E) Species. There has been no take of non-target species by WS while conducting WDM activities to reduce wildlife damage on Ohio airports. WS take of non-target species during WDM activities is expected to be extremely low to nonexistent.

Zinc Phosphide: Zinc phosphide is 2 to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Brock 1965, Evans et al. 1970, Schitoskey 1975, Bell and Dimmick 1975, Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Matscke et al. 1983, Marsh 1987, Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Tkadlec and Rychnovsky 1990, Johnson and Fagerstone 1994).

Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents (USDA 1997 Revised). Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait.

Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. They determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, however the effect was not statistically significant because of high variability in densities and the reduction was not long-term (Deisch et al. 1990).

Ramey et al. (2000) reported that 5 weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al.

(1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (*i.e.*, bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982) and Matschke et al. (1983).

Deisch et al.(1989) reported on the effect zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, however, spider mites, crickets, wolf spiders, ground beetles, darkling beetles and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Desich 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989).

WS would consult with ODNR before applying rodenticides at airports in order to confirm that no state-listed threatened or endangered rodents would be harmed in the process.

DRC-1339: The inherent safety features of DRC-1339 use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the ADC FEIS (USDA 1997 Revised, Appendix P). Although it is possible that some non-target birds may be unknowingly killed by use of DRC-1339, the method of application is designed to minimize or eliminate that risk. For example, DRC-1339 treated bait is only applied after a period of pre-baiting with untreated bait material and when non-target birds are not observed coming to feed at the site. While every precaution is taken to safeguard against taking non-target species, at times changes in local animal movement patterns and other unanticipated events could result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the current program.

Avitrol: Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Risks to nontarget birds are primarily limited through bait placement to avoid access by nontarget birds. Pre-baiting observation periods are used to ascertain risks to nontarget species and application locations are adjusted to minimize risk to nontarget species. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to 2 to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days, were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. A formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997 Revised, Appendix P).

Anticoagulant Rodent Baits: Anticoagulant rodent baits could be used in bait stations in and around airport structures. The use and proper placement of bait stations and will minimize the likelihood that the bait will be consumed by nontarget species. There may also be secondary hazards from anticoagulant baits. These risks are reduced somewhat by the fact that the predator scavenger species will usually need exposure to multiple carcasses over a period of days. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions. Risks to scavengers are also minimized by continual efforts to reduce overall wildlife activity at the airport. As already stated, WS would consult with ODNR before applying rodenticides at airports in order to confirm that no state-listed threatened or endangered rodents would be harmed in the process.

T&E Species Impacts. T&E species that are Federally and State listed (or proposed for listing) for the State of Ohio are listed in the Appendices (Appendix D & E). WS has determined that the proposed action would not adversely affect populations of State or Federally listed T&E species. The ODNR has concurred that there will be no adverse effect on State listed T&E species from WS' wildlife damage management activities at Ohio airports (Carolyn Caldwell, Program Administrator, Wildlife Management and Research Group, ODNR, letter to Andy Montoney, WS, March 2, 2006). The USFWS has concurred with WS' determination that the proposed action will have no effect on or may affect but is unlikely to adversely affect federally-listed species in Ohio (Letter from M. Knapp, PhD, Field Supervisor, USFWS Ecological Services, to T. Baranowski, WS, January 17, 2007). Any actions taken under this alternative will be conducted in accordance with recommendations and reasonable and prudent measures from the USFWS for the protection of federally listed species.

4.1.2.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS take of non-target animals would probably be less than that of the proposed action because WS would take no lethal management actions. However, risks to non-target species from WS' actions would not differ substantially from the current program because the current program has taken no non-target animals.

As discussed in Section 4.1.1.2, airport operators have a legal responsibility to exercise "due diligence" in managing wildlife hazards (Dolbeer 2005). Therefore, it is likely that airport personnel or outside contractors would seek to use lethal WDM techniques if wildlife damage problems were not effectively resolved by non-lethal management methods. This could result in less experienced persons using lethal damage management techniques and could lead to greater take of wildlife and higher risks to state and federally listed T&E species than the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.2.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be recommended and implemented to resolve wildlife conflicts in all situations. WS would not recommend or use any non-lethal WDM activities to reduce wildlife damage at airports in Ohio. Because fewer WDM management methods would be available for use by WS, it would be more difficult to reduce wildlife conflicts to an acceptable level. WS take of non-targets would be similar to or slightly higher than the current program, because it is likely that a greater number of animals would have to be lethally removed to achieve the similar efficacy as the proposed action. Due to safety considerations and airport regulations all lethal WDM methods may not be available for use in all situations. In areas where lethal WDM could not be conducted, such as areas on an airfield where discharge of firearms is not safe or allowed, wildlife damage would not be reduced. In situations where the wildlife problem could not be adequately addressed using lethal methods, non-WS personnel would likely implement their own non-lethal WDM activities. Inexperienced use of some non-lethal management techniques (i.e. habitat modification, trap and relocation) could lead to greater risks to state and federally listed T&E species than under the proposed action.

4.1.2.4 Alternative 4 – No Federal WS WDM

Alternative 4 would not allow any WS WDM at airports in Ohio. There would be no impact on non-target or T&E species by WS WDM activities from this alternative. However, because airport managers have a responsibility to manage wildlife hazards at their airports, airport personnel/contractor efforts to reduce or prevent conflicts would increase. This could result in less experienced persons implementing management methods and could lead to greater take of

non-target wildlife and risks to state and federally listed T&E species than under the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.3 Economic Losses to Property as a Result of Wildlife Damage

4.1.3.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

Many airports are concerned with the economic cost associated with damage caused by wildlife to aircraft and other airport property. Wildlife can cause severe damage to or total loss of aircraft, structural damage to aircraft hangars and buildings, damage to equipment and other property including perimeter security fencing, and obstruction and damage of water control structures. Integrated WDM, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing the risk of wildlife damage. All legally available WDM methods could possibly be implemented and recommended by WS.

4.1.3.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods to provide assistance for wildlife damage. Wildlife damage could increase under this alternative if non-lethal techniques were ineffective. Airport operations personnel requesting WDM assistance to reduce wildlife damage would not be provided information or services in lethal management. If non-lethal methods did not reduce or eliminate the wildlife damage, airport personnel/contractors would be required to develop and implement their own lethal program. Success of non-WS damage management programs would depend upon the expertise of the personnel involved. Therefore, wildlife damage to property would remain the same or greater than the proposed action.

4.1.3.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be implemented or recommended to resolve wildlife damage to property in all situations. Due to safety considerations and airport regulations all lethal WDM methods may not be available for use in all situations. In areas where lethal WDM could not be conducted, such as areas on an airfield where discharge of firearms is not safe or allowed, wildlife damage would not be reduced unless non-lethal methods were implemented by airport personnel or a private contractor. Success of non-WS damage management programs would depend upon the expertise of the personnel involved. There may be some additional risk to airport property from the use of pyrotechnics (fire hazard) if they are used by inexperienced or poorly trained personnel. Therefore, wildlife damage to property could remain the same or greater than the proposed action.

4.1.3.4 Alternative 4 – No Federal WS WDM

With no WS assistance, airport personnel/contractor would be responsible for developing and implementing their own WDM program. Airport efforts to reduce or prevent conflicts could result in less experienced persons implementing management methods. There may be some additional risk to airport property from the use of pyrotechnics (fire hazard) if they are used by inexperienced or poorly trained personnel. Overall success of these efforts would depend upon the level of training and experience of the individuals conducting the WDM., Therefore, wildlife damage to property could remain the same or greater than the proposed action.

4.1.4 Impacts on Human Health and Safety from WDM Activities

4.1.4.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

Strict adherence to label requirements and use restrictions helps to assure that use of registered chemical products would not have adverse effects on human health and safety. Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, all appropriate state and federal laws, and WS policy and guidance, that risks to human health and safety to WS employees, recreationists or residents from the proposed methods were highly unlikely (USDA 1997 Revised, Appendix P).

Non-chemical WDM methods that might raise safety concerns include shooting with firearms, use of traps and snares, and harassment with pyrotechnics. WS personnel receive safety training on a periodic basis to assure that WS personnel are aware of safety concerns associated with specific WDM methods. Firearms and pyrotechnics are only used by WS personnel who are experienced in handling and using them. In addition, all WS employees who use firearms are required to pass a safety course or receive firearms safety training. WS traps are strategically placed to minimize exposure to humans and pets. Body-grip (i.e. Conibear) traps for beaver and muskrats are restricted to water sets, which further reduce threats to public and pet health and safety. The OH WS program has had no accidents involving the use of firearms, traps, or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS operational WDM methods found that risks to human safety were low (USDA 1997 Revised, Appendix P). Therefore, no adverse impacts on human safety from WS use of non-chemical WDM methods are expected.

4.1.4.2 Alternative 2 – Non-lethal WDM only, by WS

Alternative 2 would not allow WS to use any lethal methods at airports in Ohio. WS could only implement non-lethal methods such as harassment and exclusion devices and materials. Chemical methods that could be used under this alternative would be restricted to repellents and tranquilizing and immobilization drugs. Risks to human health and safety from WS use of non-lethal chemical methods would be the same as under Alternative 1. It is likely that airport personnel/contractors would use lethal chemical WDM techniques if WS is not able to use these methods. Risks to human health and safety will vary depending upon the experience and training of the individual using the methods. DRC-1339 and alpha chloralose are currently only available for use by WS personnel, so these methods would not be available under this alternative. However, Starlicide, an avicide with the same active ingredient as DRC-1339, would still be available for use by non-WS personnel. Overall, the risks to human health and safety from WDM methods would be similar to or slightly higher than the proposed action.

Under this alternative, WS would not use firearms for lethal management during WDM but would still be able to use them as a harassment method. WS would also use pyrotechnics. Risks to human safety from WS use of firearms and pyrotechnics would be similar to the current program alternative. However since WS will not be providing lethal WDM assistance, an increase in the use of lethal mechanical WDM methods by less experienced and trained individuals may occur. Risks to human health and safety will depend upon the training and experience of the individuals conducting the WDM.

Overall risks to human health and safety will be similar to or greater than the proposed alternative depending upon the training and experience of any individuals using lethal WDM techniques that would not be available to WS.

4.1.4.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, WS would only use lethal chemical WDM techniques to resolve wildlife

damage at airports. Tranquilizing and immobilization drugs would only be used for animals that would be euthanized after capture. There may be higher use of lethal techniques than with the current program because there are situations where additional animals will be taken in order to achieve results similar to the proposed action. The low risks to human health and safety from these methods may be slightly higher because WS use of chemical WDM methods would likely be higher than under the proposed action. Airport personnel could still use non-lethal chemical WDM techniques except for those methods restricted to use by WS (e.g., alpha chloralose).

Under this alternative, only lethal mechanical WDM techniques would be implemented to resolve wildlife damage in all situations. WS would not recommend or use any non-lethal WDM activities to reduce wildlife damage at airports in Ohio. WS use of non-chemical lethal WDM methods, would not differ substantially from the program described in Alternative 1. t conflicts could still result in less experienced persons implementing management methods. Lethal methods are unlikely to resolve all damage problems and there are likely to be places where these methods cannot be used. Airport personnel/contractors are likely to implement non-lethal techniques on their own. Depending upon the experience and training of the individual conducting the WDM, there may be increased risks from pyrotechnics and firearms used for hazing wildlife.

Overall risks of this alternative to human health and safety are likely to be similar to or greater than the proposed action depending upon the actions of the airport manager/private contractor.

4.1.4.4 Alternative 4 – No Federal WS Wildlife Damage Management

Alternative 4 would not allow any WS WDM at airports in Ohio. Concerns about human health risks from WS use of any WDM methods would be alleviated because no such use would occur. DRC-1339 and Alpha-Chloralose are only registered for use by WS personnel, and would not be available for use by airport personnel or government contractors. However, Starlicide, an avicide with the same active ingredient as DRC-1339, would still be available for use by non-WS personnel. The immobilizing and euthanizing chemicals are only available for use by certified WS personnel or a licensed veterinarian. Avitrol would also be available to commercial pest control services. Airport mangers/private contractors would continue to use firearms, traps, snares, and pyrotechnics in the absence of WS assistance. Risks to human safety under this alternative could increase or remain about the same as the proposed action depending upon the training and level of experience of the individual conducting the WDM.

4.1.5 Impacts on Human Safety from Wildlife Strike Hazards to Aircraft

4.1.5.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

Airport personnel are concerned with potential injury and loss of human life as a result of wildlife/aircraft collisions. An Integrated WDM strategy, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing the risk of wildlife aircraft strikes. All WDM methods could possibly be implemented and recommended by WS.

4.1.5.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would be restricted to implement and recommend only non-lethal methods to provide assistance for wildlife damage. Wildlife strikes could increase under this alternative if non-lethal techniques were ineffective. However, airport operators have a legal responsibility to exercise “due diligence” in managing wildlife hazards (Dolbeer 2005) and it is likely that airport managers/private contractors will conduct lethal WDM in the absence of assistance from WS. Success of efforts by non-WS personnel will be dependent upon the training and expertise of the personnel involved. Therefore, wildlife strike hazards could be greater or

remain the same as the proposed action.

4.1.5.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be implemented or recommended to resolve wildlife strike hazards in all situations. However, due to safety considerations and airport regulations all lethal WDM methods would not be available for use in all situations. In areas where lethal WDM could not be conducted, such as areas on the airfield where discharge of firearms is not safe or allowed, wildlife strikes would not be reduced. However, airport operators have a legal responsibility to exercise "due diligence" in managing wildlife hazards (Dolbeer 2005) so it is likely that airport managers/private contractors will conduct non-lethal WDM in the absence of assistance from WS. Success of efforts by non-WS personnel will be dependent upon the training and expertise of the personnel involved. Therefore, impacts on human safety could be greater under this alternative than the proposed action.

4.1.5.4 Alternative 4 – No Federal WS WDM

With no WS assistance, airport personnel would be responsible for developing and implementing their own WDM program. Airport efforts to reduce or prevent conflicts could result in less experienced persons implementing management methods, therefore leading to a greater risk of not reducing wildlife strikes, than under the proposed action.

4.1.6 Impacts on Aesthetics

4.1.6.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species

4.1.6.1.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

People who routinely view or feed individual birds and mammals such as geese and deer would likely be disturbed by removal of such animals under the current program. Some people have expressed opposition to the killing of any animal during WDM activities. Under the current program, some lethal management of wildlife would continue and these persons would continue to be opposed to the program. However, many people who voice opposition have no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS lethal management activities. Lethal management actions would generally be restricted to local sites and to a minimal number of animals. Therefore, the species subjected to limited lethal management actions would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest.

Some individuals do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. These people would feel their interests are harmed by WS non-lethal harassment program. However, harassment programs do not kill animals or diminish overall numbers of wild animals in the area. People who like to view these species can still do so at other sites like state parks where the land owners/managers are not experiencing damage from wildlife and are tolerant of their presence.

4.1.6.1.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would not conduct any lethal WDM but would still conduct harassment of wildlife that was causing damage. People who oppose lethal management of wildlife by government but are tolerant of government involvement in non-lethal wildlife damage management are likely to favor this alternative.

Some individuals do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. These people would feel their interests are harmed by WS non-lethal harassment program. However, harassment programs do not kill animals or diminish overall numbers of wild animals in the area. People who like to view these species can still do so at other sites like state parks where the land owners/managers are not experiencing damage from wildlife and are tolerant of their presence.

Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS lethal WDM activities under this alternative because WS would not kill the individual animal(s). However, airport personnel would likely conduct lethal WDM activities that would no longer be conducted by WS. This may result in the lethal removal of more animals than if the lethal WDM were conducted by trained personnel from WS. Therefore the impacts of this alternative would be similar to or greater than the proposed action.

4.1.6.1.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. Lethal techniques are not suitable for all situations, so non-lethal techniques are still likely to be used by the airport manager/private contractor. People that have expressed opposition to the killing of any bird or mammal during WDM activities would likely be opposed to this alternative. Impact of this alternative on aesthetic enjoyments of wildlife may be greater than Alternative 1, because WS would not be using or promoting the use of non-lethal techniques and because it is likely to require removal of more animals to achieve levels of efficacy similar to Alternative 1.

4.1.6.1.4 Alternative 4 – No Federal WS WDM

Under this alternative, WS would not conduct any lethal or non-lethal WDM activities. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS activities under this alternative. However, airport personnel/contractors would likely conduct similar WDM activities as those that would no longer be conducted by WS. Depending upon the training and experience of the individuals conducing the WDM, this may result in the lethal removal of more animals than if the lethal WDM were conducted by trained personnel from WS. Therefore the impacts of this alternative would be similar to or greater than the proposed action.

4.1.6.2 Effects on Aesthetic Values of Property Damaged by Wildlife

4.1.6.2.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

Some of the types of damage that would be managed by WS may have a negative impact on the aesthetic values of airports and the surrounding property (e.g., accumulations of bird feces, flooding resulting from beaver activity, vegetation damage by a variety of

species. WS would provide operational and technical assistance in reducing nuisance mammal damage including damage to drainage structures and damage to landscaping and other vegetation, which is likely to improve aesthetic value of the airport and surrounding properties. If successful in reducing damage, WS' activities should improve aesthetic values of properties in the view of the airport. All WDM methods would be available for use including non-lethal and lethal techniques. Relocation of nuisance animals, including use of harassment and frightening devices, can sometimes result in the animals causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating wildlife, coordination with local authorities to monitor the wildlife movements is generally conducted to assure they do not reestablish in other undesirable locations.

4.1.6.2.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would only provide non-lethal operational and technical assistance to reduce problems with wildlife at airports. Impacts of WS' use of non-lethal methods would be similar to Alternative 1 save that non-lethal methods would be used more often which may cause increased movement of animals to other sites. If WS is providing direct operational assistance in relocating wildlife, coordination with local authorities to monitor the wildlife movements is generally conducted to assure they do not reestablish in other undesirable locations.

If non-lethal WDM methods were not effective in reducing wildlife problems, WS would not be able to recommend or implement any potentially successful lethal WDM methods. Airport managers/private contractors would likely implement their own management methods, which can have varying success depending upon the training and level of experience of the individuals involved. Some lethal methods may also serve as frightening devices (e.g., shooting birds). Coordination with local authorities to monitor bird and wildlife movements to assure they do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

4.1.6.2.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. In areas where lethal WDM is not effective or could not be conducted, such as areas on the airfield where discharge of firearms is not safe or allowed, wildlife damage would not be reduced. Each airport would be required to develop and implement their own non-lethal WDM programs. Relocation of nuisance wildlife or bird roosts through harassment, barriers, or habitat alteration can sometimes result in causing the same problems at a new location. If WS does not provided non-lethal assistance to airport personnel, coordination with local authorities to monitor bird and wildlife movements to assure they do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

4.1.6.2.4 Alternative 4 – No Federal WS WDM

Under this alternative, WS would not provide any operational or technical assistance in reducing wildlife problems. Airport managers are likely to conduct/contract for an alternative WDM program. Impact on aesthetic values of the airport(s) and surrounding properties would depend on the experience and training of the individuals conducting the

WDM. Coordination with local authorities to monitor bird and wildlife movements to assure they do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

4.1.7 Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS

4.1.7.1 Alternative 1 – Implement a Federal Wildlife Damage Management Program (Proposed Action/No Action)

Under this alternative, methods viewed by some persons as inhumane would continue to be used in WDM actions by WS. Some people would view methods employed to capture and/or kill hazardous wildlife for airport safety purposes and the protection of property as inhumane. However, it is important to note that activities conducted by WS at airports in Ohio during FY2003 were more than 98% non-lethal.

Humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. However, humaneness as it relates to the natural world through natural mortality versus man-induced mortality must be brought into perspective. DeVos and Smith (1995) explain the characteristics of natural mortality in wildlife populations. There seems to be an increasing public perception that, left alone by humans, animal populations will experience few premature deaths and live to an old age without harm, pain or suffering. It should be recognized that wildlife populations reproduce at far greater rates than would be necessary to replace deaths if all lived to old age. To counterbalance this high reproduction, it is natural for most individuals of most species to die young, often before reaching breeding age. Natural mortality in wildlife populations includes predation, malnutrition, disease, inclement weather, and accidents. These "natural" deaths are often greater in frequency than human-caused deaths through regulated hunting, trapping, and wildlife damage management operations. From the standpoint of the animal, these natural mortality factors also may cause more suffering by wildlife, as perceived by humans, than human-induced mortality.

Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1997 Revised). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. To insure the most professional handling of these issues and concerns, APHIS-WS has policies giving direction toward the achievement of the most humane program possible while still accomplishing the program's mission.

APHIS-WS has improved the selectivity of management devices through research and development of pan-tension devices for foothold traps and other device modifications such as breakaway snares. Research is continuing with the goal of bringing new findings and products into practical use. Until such time as new findings and products are found to be practical, some animal suffering will occur during lethal collection of animal specimens if monitoring and program effectiveness objectives are to be met. APHIS-WS has also improved the humaneness of current management devices through the incorporation of veterinary medical tranquilizers, immobilizers, and euthanizing agents.

WDM methods employed by WS would include shooting, lethal trapping, snares and toxicants/chemicals such as immobilizing and euthanizing drugs, rodenticides, DRC-1339, and

Avitrol. Shooting, when performed by experienced professionals, usually results in a quick death for target animals. Occasionally, however, some birds and mammals are initially wounded and must be shot a second time or must be caught by hand and then euthanized. Some persons would view shooting as inhumane. The perceived stress and trauma associated with being held in leghold traps or snares until the WS employee arrives to euthanize the animal, is unacceptable to some persons. Another lethal WDM methods used to take target animals include body-gripping traps (i.e., snap traps and Conibears). These traps result in a relatively humane death because the animals die instantly or within seconds to a few minutes. The primary lethal bird chemical WDM method that would be used by WS under this alternative would be DRC-1339 (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes; which are primarily disease, starvation, and predation. For these reasons, WS considers DRC-1339 use under the current program to be a relatively humane method of lethal WDM. However, despite the apparent lack of distress in treated birds, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable. The chemical Avitrol repels birds by poisoning a few members of a flock, causing them to become hyperactive (see discussion in Appendix B). Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock, and the affected birds generally die. Some persons would view Avitrol as inhumane treatment of the affected birds, based on the birds' distress behaviors.

Occasionally, birds captured alive by traps, by hand or with nets would be euthanized. The most common methods of euthanasia would be cervical dislocation and CO_2 gas which are both AVMA-approved euthanasia methods (Beaver et al 2001). Most people would view AVMA-approved euthanasia methods as humane.

The primary lethal chemical WDM method that would be used for small mammals by WS under this alternative would be rodenticides. Although it is difficult to develop objective quantitative measurements of pain or stress, rodents affected by these chemicals rarely display any evidence of pain. The rodents usually become listless and lethargic, and a quiet death normally occurs in 48 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes; which are primarily disease, starvation, and predation. For these reasons, WS considers rodenticide use under the current program to be a relatively humane method of lethal WDM. However, despite the apparent painlessness of the effects of these chemicals, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable. Occasionally, mammals captured alive by traps, by hand or with nets would be euthanized. The most common methods of euthanasia for mid – larger size mammals would be gun shot or chemical injection, both of which are AVMA-approved euthanasia methods when used in accordance with AVMA guidelines (Beaver et al 2001). However, when working under field conditions, shot placement may not be as defined by the AVMA for perfect euthanasia. WS specialists are trained to use WDM techniques in a manner that minimizes pain and suffering and results in as quick and quiet a death as possible.

4.1.7.2 Alternative 2 – Non-lethal WDM only, by WS

Under this alternative, WS would not use lethal methods viewed as inhumane by some persons. However, non-lethal methods are unlikely to resolve all problems at airports. Airport managers are likely to seek alternative lethal means of WDM. Impacts of lethal methods implemented by non-WS employees could be similar or greater than the proposed action depending upon the training and experience of the individuals conducting the work. Unless the airport contracts for the services of a licensed veterinarian, the use of State and Federally controlled capture/euthanasia chemicals would be illegal. Cumulative impacts of WS and non-WS actions on the perceived humaneness of the program are likely to be similar to Alternative 1.

4.1.7.3 Alternative 3 – Lethal WDM only, by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. These methods would include shooting, trapping, snares, and the use of toxicants/chemicals that may be viewed by some persons as inhumane. Many individuals may perceive this alternative as being the least humane because lethal techniques would be readily available from WS, but WS would not be recommending or using reasonable, effective non-lethal alternatives. There is likely to be more lethal WDM to achieve levels of damage management similar to the proposed action.

4.1.7.4 Alternative 4 – No Federal WS WDM

Under this alternative, lethal methods viewed as inhumane by some persons would not be used or recommended by WS. Unless the airport contracts for the services of a licensed veterinarian, the use of State and Federally controlled capture/euthanasia chemicals would be illegal. Shooting, and WDM trapping and capture methods are likely to be used by non-WS entities and, similar to the current program alternative, would be viewed by some persons as inhumane. Overall, it is likely that WDM would be similar or somewhat less humane with this alternative than under the proposed action, dependent upon the training and expertise of the person implementing management methods.

4.2 Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the 4 alternatives (Table 4-1). Under the Proposed Action and Alternative 3, the lethal removal of wildlife would not have a significant impact on overall wild bird and mammal populations in Ohio, but some short-term local reductions may occur. Risks assessments in the WS programmatic EIS (USDA 1997 Revised, Appendix P) indicate that the proposed action will not result in accumulation of pesticides in the environment. No risk to public safety is expected when services are provided by WS and accepted by requesting individuals in Alternatives 1, 2, and 3, because only trained and experienced wildlife biologists would conduct and recommend WDM activities. However, there may be a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1, 2 and 3 conduct WDM activities on their own, and when no WS assistance is provided in Alternative 4. It is likely that impacts would not be significant in all 4 Alternatives, regardless of implementing agency, however, WS personnel are trained and experienced in wildlife damage management at airports and follow State and Federal guidelines. Although some persons will likely be opposed to WS' participation in WDM activities to protect property and human health and safety at airports in Ohio, the analysis in this EA indicates that WS Integrated WDM program will not result in significant cumulative adverse impacts on the quality of the human environment.

Table 4-1. Summary of the expected impact of each of the alternatives on each of the issues.

Issues/Methods	Alternative 1 – Implement a Federal WDM Program (Proposed Action/No Action)	Alternative 2 – Non-lethal WDM Only, by WS	Alternative 3 – Lethal WDM Only, by WS	Alternative 4 – No Federal WS WDM
Effects on Target Wildlife Species Populations	Very low impact on state, regional and national wildlife populations.	WS would have no effect on wildlife populations. Impacts may equal or greater than the proposed action dependent upon actions taken by non-WS personnel.	Very low impact on state, regional and national wildlife populations. Impacts of WS actions may be slightly higher than Alternative 1.	WS would have no effect on wildlife populations. Results may equal or greater than the proposed action dependent upon actions taken by non-WS personnel.
Effects on Nontarget Species Populations, including T&E Species	Very low risk.	No probable effect. If airports conduct lethal removal without WS, there is an increased possibility that non-target species may be taken.	Very low risk, but overall risk of WS actions may be slightly higher because of increased WS use of lethal methods.	WS would have no effect on wildlife populations. If airports conduct lethal removal without WS, there is an increased possibility that non-target species may be taken.
Economic Losses to Property as a Result of Wildlife Damage	The proposed action has the greatest potential of successfully reducing this risk.	There is a greater potential of not reducing wildlife property damage than the proposed action.	There is a greater potential of not reducing wildlife property damage than the proposed action.	There is a greater potential of not reducing wildlife property damage than the proposed action.
Impacts on Human Health and Safety from WDM methods.	Very low risk	Risks may be higher if individuals with less training and experience than WS personnel attempt to use lethal WDM techniques.	Risks may be higher if individuals with less training and experience than WS personnel attempt to use some non-lethal WDM techniques like pyrotechnics and shooting to frighten wildlife.	Risks may be higher if individuals with less training and experience than WS personnel attempt to conduct WDM.
Impacts on Human Health and Safety from Wildlife Strike to Aircraft	The proposed action has the greatest potential of successfully reducing this risk.	There is a greater potential of not reducing threats to human health and safety from wildlife strikes to aircraft than under the proposed action. control methods.	There is a greater potential of not reducing threats to human health and safety from wildlife strikes to aircraft than under the proposed action. control methods.	Airport efforts to reduce conflicts could result in less experienced persons conducting WDM and a greater risk of not reducing wildlife strikes than under the proposed action.

Issues/Methods	Alternative 1 – Implement a Federal WDM Program (Proposed Action/No Action)	Alternative 2 – Non-lethal WDM Only, by WS	Alternative 3 – Lethal WDM Only, by WS	Alternative 4 – No Federal WS WDM
Effects on Aesthetics	Variable. Airports who are receiving damage would favor this alternative. Some people would oppose this alternative.	Variable. Some people would favor this alternative; however, airports would probably impose their own lethal management, resulting in impacts similar to Alternative 1.	Variable. More lethal WDM would be conducted by WS than under Alternative 1. Overall efficacy will depend on actions of airport managers and individuals that may conduct non-lethal WDM..	No effect by WS. Airport personnel would likely conduct similar WDM activities no longer conducted by WS, resulting in impacts similar to the current program alternative.
Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS	Some people will view as inhumane because WS would be using lethal WDM techniques. Others will view as more humane than alternative 3.	People opposed to WS use of lethal methods might perceive this as more humane, but lethal methods are sill likely to be used by airport managers.	This may be perceived as the least humane because WS will be using lethal more than under Alt. 1 and will not be encouraging or using appropriate non-lethal	No effect by WS. Airports would likely implement a similar WDM plan, and results would likely be similar or somewhat less humane with this alternative than under the proposed action.

Appendix A

LITERATURE CITED

AVMA (American Veterinary Medical Association). 1987. Journal of the American Veterinary Medical Association. Panel Report on the Colloquium on Recognition and Alleviation of Animal Pain and Distress. 191:1186-1189.

Apa, A., D. Uresk, and R. Linder. 1991. Impacts of black-tailed prairie dog rodenticides on nontarget passerines. Great Basin Nat. 51:301-309.

Arhart, D.K. 1972. Some factors that influence the response of starlings to aversive visual stimuli. M.S. Thesis. Oregon State University Corvallis.

Avery, M.L., J.S. Humphrey, and D.G. Decker. 1997. Feeding deterrence of anthraquinone, anthracene, and anthrone to rice-eating birds. J. Wildl. Manage. 61(4):1359-1365.

Barras, S.C., and S.E. Wright. 2002. Civil aircraft collisions with birds and other wildlife in Ohio 1990-1999. Ohio J. Sci. 102(2): 2-7.

Beaver, B.V., W. Reed, S. Leary, B. McKiernan, F. Bain, R. Schultz, B. T. Bennett, P. Pascoe, E. Shull, L.C. Cork, R. Francis-Floyd, K.D. Amass, R. Johnson, R.H. Schmidt, W. Underwood, G.W. Thorton, and B. Kohn. 2001. 2000 Report of the AVMA panel on euthanasia. Journal of the American Veterinary Medical Association 218:669-696.

Bell, H. B., and R. W. Dimmick. 1975. Hazards of predators feeding on prairie voles killed with zinc phosphide. J. Wildl. Manage 9:816-819.

Bent, A. C. 1921. Life histories of North American gulls and terns. U. S. National Museum Bulletin 113. 345pp.

Berryman, J. H. 1991. Animal damage management: responsibilities or various agencies and the need for coordination and support. Proc. East. Wildl. Damage Control Conf. 5:12-14.

Besser, J.F., W. C. Royal, and J. W. DeGrazio. 1967. Baiting starlings with DRC-1339 at a cattle feedlot. J. Wildl. Manage. 3:48-51.

Bishop, R. C. 1987. Economic values defined. Pages 24 -33 *in* D. J. Decker and G. R. Goff, eds. Valuing wildlife: economic and social perspectives. Westview Press, Boulder, CO. 424pp.

Blanton, E. M., B. U. Constantin, and G. L. Williams. 1992. Efficacy and methodology of urban pigeon control with DRC-1339. Proc. East. Wildl. Damage Cont. Conf. 5:58-62.

Blokpoel, H. 1976. Bird Hazards to Aircraft. Books Canada Inc. Buffalo, NY. 236pp.

Blokpoel, H. and G.D. Tessier. 1986. The ring-billed gull in Ontario: a review of a new problem species. Occasional Paper Number 57. Canadian Wildlife Service. Ottawa, Ontario. 34pp.

Blokpoel, H. and G.D. Tessier. 1992. Control of ring-billed gulls and herring gulls nesting in urban and industrial sites in Ontario, 1987-1990. Proceedings of the Eastern Wildlife Damage Conference 5: 51-57.

Bomford, M. 1990. Ineffectiveness of a sonic device for deterring starlings. Wild. Soc. Bull. 18:(2):151-156.

Brock, E. M. 1965. Toxicological feeding trials to evaluate the hazards of secondary poisoning to gopher snakes,

Pituophis catenifer. Copeia 2:244-245.

CDFG (California Department of Fish and Game). 1991. California department of fish and game. Final environmental document - bear hunting. Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, State of California, April 25, 1991. 13pp.

Clark, L. 1997. Dermal contact repellents for starlings: foot exposure to natural plant products. J. Wildl. Manage. 61(4):1352-1358.

Cleary, E. C., and R. A. Dolbeer. 1999. Wildlife hazard management at airports, a manual for airport personnel. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Safety and Standards, Washington, DC. 248pp. (http://wildlife-mitigation.tc.faa.gov/).

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2002. Wildlife strikes to civil aircraft in the United States, 1990-2001. U.S. Department of Transportation, Federal Aviation Administration, Serial Report No. 8, DOT/FAA/AS/00-6(AAS-310). Washington DC USA. 50 pages (http://wildlife-mitigation.tc.faa.gov/).

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2004. Wildlife strikes to civil aircraft in the United States, 1990–2003. Serial Report Number 10. Federal Aviation Administration, Office of Airport Safety and Standards, Washington, DC. 56pp.

Code of Federal Regulations (CFR). 1995. Chapter 1 Wildlife and Fisheries. Part 21 Subpart D. P371. Office of the Federal Register. U.S. Government Printing Office. Washington D.C.

Conover, M. R. 1982. Evaluation of behavioral techniques to reduce wildlife damage. Proc. Wildl.-Livestock Relation. Sym. 10:332-344.

Conover, M. R., W.C. Pitt, K.K. Kessler, T.J. Dubow, and W.A. Sanborn. 1995. Review of human injuries, illnesses and economic-based losses caused by wildlife in the United States. Wildl. Soc. Bull. 23:407-414.

Cunningham, D.J., E.W. Schafer, and L.K. McConnell. 1981. DRC-1339 and DRC-2698 residues in starlings: preliminary evaluation of their effects on secondary hazard potential. Proc. Bird Control Semin. 8:31-37.

Davis, J.W., R.C. Anderson, L. Karstad, and D.O. Trainer. 1971. Infectious and Parasitic Diseases of Wild Birds. Iowa State University Press, Ames, Iowa.

Day, G. I., S. D. Schemnitz, and R. D. Taber. 1980. Capturing and marking wild animals. pp. 61-88 *in* Wildlife management techniques manual. S. D. Schemnitz ed. The Wildlife Society, Inc. Bethesda, MD. 686pp.

Decino, T.J., D.J. Cunningham, and E.W. Schafer. 1966. Toxicity of DRC-1339 to starlings. J. Wildl. Manage. 30(2):249-253.

Decker, D. J., and G. R. Goff. 1987. Valuing Wildlife: Economic and Social Perspectives. Westview Press. Boulder, Colorado. 424pp.

Deisch, M. S. 1986. The effects of three rodenticides on nontarget small mammals and invertebrates. M.S. Thesis, South Dakota State Univ., Brookings.

Deisch, M. S., D. W. Uresk, and R. L. Linder. 1989. Effects of two prairie dog rodenticides on ground dwelling invertebrates in western South Dakota. Proc. Great Plains Wildl. Damage Cont. Workshop 9:166-170.

Deisch, M. S., D. W. Uresk, and R. L. Linder. 1990. Effects of prairie dog rodenticides on deer mice in western South Dakota. Great Basin Nat. 50:347-353.

DeVos, Jr., J.C. and J.L. Smith. 1995. Natural mortality in wildlife populations. Proactive Strategies Committee

Report #1. Proactive Strategies Project of the International Association of Fish and Wildlife Agencies and Arizona Game and Fish Department.

Dolbeer, R. A. 2005. Bird and other wildlife hazards at airports: liability issues for airport managers. U.S. Department of Agriculture, Wildlife Services, Sandusky, Ohio, USA. Special Report, Airport Safety and Assistance Program. Version 2005.1. 5 pages.

Dolbeer, R.A., J.L. Belant, and L. Clark. 1993. Methyl anthranilate formulations to repel birds form water at airports and food at landfills. Proc. Great Plains Wildl. Damage Contr. Workshop. 11:42-52.

Dolbeer, R.A., L. Clark, P.P. Woronecki, and T.W. Seamans. 1992. Pen tests of methyl anthranilate as a bird repellent in water. Proc. East. Wildl. Damage Control Conf. 5:112-116.

Dolbeer, R.A., and P. Eschenfelder. 2003. Amplified bird-strike risks related to population increases of large birds in North America. Proceedings International Bird Strike Committee 26 (Volume 1):49-67.

Dolbeer, R.A., T.W. Seamans, B.F. Blackwell, J.L. Belant. 1998. Anthraquinone formulation (Flight Control™) shows promise as avian feeding repellent. J. Wildl. Manage. 62(4)1558-1564.

Dolbeer, R.A., P.P. Woronecki, and R.L. Bruggers. 1986. Reflecting tapes repel blackbirds from millet, sunflowers, and sweet corn. Wildl. Soc. Bull. 14:418-425.

Dolbeer, R.A., P.P. Woronecki, T.W. Seamans, B.N. Buckingham and E.C. Cleary. 1990. Herring gulls, *Larus argentatus*, nesting on Sandusky Bay, Lake Erie, 1989. Ohio Journal of Science 90(3): 87-89.

Dolbeer, R.A., S.E. Wright, and E.C. Cleary. 2000. Ranking the hazard level of wildlife species to aviation. Wildl. Soc. Bull. 28(2):372-378.

Evans, J., P. L. Hegdal, and R. E. Griffiths, Jr. 1970. Methods of controlling jackrabbits. Proc. Vertebr. Pest Conf. 4:109-116.

Feare, C., A.J. Isaacson, P.A. Sheppard, and J.M. Hogan. 1981. Attempts to reduce starling damage at dairy farms. Protection Ecol. 3(2):173-181.

Fowler, M.E. and R.E. Miller. 1999. Zoo and Wild Animal Medicine. W.B. Saunders Co. Philadelphia, PA.

Glahn, J.F. 1982. Use of starlicide to reduce starling damage at livestock feeding operations. Proc. Great Plains Wildl. Damage Control Workshop. 5:273-277.

Glahn, J.F., S.K. Timbrook, and D.J. Twedt. 1987. Temporal use patterns of wintering starlings at a southeastern livestock farm: implications for damage control. Proc. East. Wildl. Damage Control Conf. 3:194-203.

Glahn, J.F., and E. A. Wilson. 1992. Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. Proc. East. Wildl. Damage Cont. Conf. 5:117-123.

Gottschang, J.L. 1981. A Guide to the Mammals of Ohio. Ohio State University Press. Columbus, Ohio. 176pp.

Graves, G. E., and W. F. Andelt. 1987. Prevention and control of woodpecker damage. Service in Action, Colo. St. Univ. Coop. Ex. Serv. Publ. no 6.516. Ft. Collins, Colo. 2pp.

Hartman, F.E. 1992. Mallard. *in* Atlas of Breeding Birds in Pennsylvania. Daniel W. Brauning, editor. University of Pittsburgh Press, Pittsburgh, PA. pp 74-75.

Hegdal, P. L., and T. A. Gatz. 1977. Hazards to pheasants and cottontail rabbits associated with zinc phosphide baiting for microtine rodents in orchards. Final report by the USFWS under Interagency Agreement EPA-

IAG-D4-0449. 35pp.

Hegdal, P. L., T. A. Gatz, and E. C. Fite. 1980. Secondary effects of rodenticides on mammalian predators. pp. 1781-1793 *in*. Proc. Worldwide Furbearer Conf. J. A. Chapman and D. Pursley, eds Frostburg, MD.

Hygnstrom, S. E., and S. R. Craven. 1994. Hawks and owls. pp. E53-62 *in* Prevention and control of wildlife damage. S. Hygnstrom, R. Timm, and G. Larson eds. Coop. Ext. Serv. Univ. of Nebr.-Lincoln

Heusmann, H.W., and R. Bellville. 1978. Effects of nest removal on starling populations. Wilson Bull. 90(2):287-290.

Hill, E. F., and J. W. Carpenter. 1983. Potential hazard to black-footed ferrets from secondary zinc phosphide poisoning. USFWS, Res. Inform. Bull. 83-10. 1 pp.

Holler, N. R. and E. W. Schafer. 1982. Potential secondary hazards of avitrol baits to sharp-shinned hawks and American kestrels. Journal of Wildlife Management 46:457-462.

Johnson, G. D., and K. A. Fagerstone. 1994. Primary and secondary hazards of zinc phosphide to nontarget wildlife - a review of the literature. USDA-APHIS-DWRC Res. Rep. No. 11-55-005.

Johnson, R.J., and J.F. Glahn. 1994. European Starlings. p. E-109 - E-120 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Leopold, A. S. 1933. Game Management. Charles Scribner & Sons. NY, NY. 481pp.

Linnel, M.A., M.R. Conover, and T.J. Ohashi. 1996. Analysis of bird strikes at a tropical airport. J. Wild. Manage. 60:935-945.

McCracken H.F. 1972. Starling control in Sonoma County. Proc. Vertebr. Pest Conf. 5:124-126.

Marsh, R. E. 1987. Relevant characteristics of zinc phosphide as a rodenticide. Proc. Great Plains Wildl. Damage Control Workshop 8:70-74.

Mason, J.R., M.A. Adams, and L. Clark. 1989. Anthranilate repellency to starlings: chemical correlates and sensory perception. J. Wildl. Manage. 53:55-64.

Mason, J.R., A. H. Arzt, and R.F. Reidinger. 1984. Evaluation of dimethylanthranilate as a nontoxic starling repellent for feedlot settings. Proc. East. Wildl. Damage Control Conf. 1:259-263.

Matschke, G. H., M. P, Marsh, and D. L. Otis. 1983. Efficacy of zinc phosphide broadcast baiting for controlling Richardson's ground squirrels on rangelands. J. Range Manage. 36:504-506.

Mott. D.F. 1985. Dispersing blackbird-starling roosts with helium-filled balloons. Proc. East. Wildl. Damage Conf. 2:156-162.

Mumford, R.E., and J.O. Whitaker Jr. 1984. Mammals of Indiana. Indiana University Press. Bloomington, IN. p. 370-380.

National Audubon Society (2002). The Christmas Bird Count Historical Results [Online]. Available http://www.audubon.org/bird/cbc. Accessed June 15, 2005

Ohio Department of Natural Resources. 2004. Ohio Wildlife Population Status and Hunting Forecast 2003-2004.

Ohio Department of Transportation (ODOT)-Office of Aviation. 2003. Ohio Airport Directory 2003-2004.

Columbus, OH. 344 pp.

Peterjohn, B.G. 2001. The Birds of Ohio. The Wooster Book Company. Wooster, OH. P 170-171.

Pochop, P.A. 1998. Comparison of white mineral oil and corn oil to reduce hatchability of ring-billed gull eggs. Proc. Vertebr. Pest Conf. 18:411-413.

Pochop, P.A., J.L. Cummings, J.E. Steuber, and C.A. Yoder. 1998. Effectiveness of several oils to reduce hatchability of chicken eggs. J. Wildl. Manage. 62(1):395-398.

Ramey, C. A., J. B. Bourassa, J. E. Brooks. 2000. Potential risks to ring-necked pheasants in California agricultural areas using zinc phosphide. Internat. Biodeter, Biodegrad. 45:223-230

Richardson, W.J. 1994. Serious birdstrike-related accidents to military aircraft of ten countries: preliminary analysis of circumstances. Proc. Bird Strike Commit. Europe 22:129-152.

Robinson, M. 1996. The potential for significant financial loss resulting from bird strikes in or around an airport. Proceedings of the Bird Strike Committee Europe. 22:353-367.

Rossbach, R. 1975. Further experiences with the electroacoustic method of driving starlings from their sleeping areas. Emberiza 2(3):176-179.

Royall, W. C., T.J. DeCino, and J.F. Besser. 1967. Reduction of a Starling Population at a Turkey Farm. Poultry Science. Vol. XLVI No. 6. p. 1494-1495.

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD

Schafer, E. W. 1991. "Bird control chemicals-nature, mode of action and toxicity." pp. 599-610 *in* CRC Handbook of Pest Management in Agriculture Vol. II. CRC Press, Cleveland, OH.

Schafer, E. W., Jr., R. B. Brunton, and N. F, Lockyer. 1974. Hazards to animals feeding on blackbirds killed with 4-Aminopyridine baits. Journal of Wildlife Management. 38:242-246.

Scharf, W.C., G.W. Shugart, and M.L. Chamberlain. 1978. Colonial birds nesting on man-made and natural sites in the U.S. Great Lakes. Vicksburg, MS: U.S. Army Engineer Waterways (Experiment Station Report TR-D-78-10).

Schitoskey, F. 1975. Primary and secondary hazards of three rodenticides to kit fox. J. Wildl. Manage. 39:416-418.

Schmidt, R. H. 1989. Animal welfare and wildlife management. Trans. N. A. Wildl. And Nat. Res. Conf. 54:468-475

Schmidt, R.H. and R.J. Johnson. 1984. Bird dispersal recordings: an overview. ASTM STP 817. 4:43-65.

Siefried, W. R. 1968. The reactions of certain birds to rodent baits treated with zinc phosphide. The Ostrich 39:197-198.

Shirota, Y.M. and S. Masake. 1983. Eyespotted balloons are a device to scare gray starlings. Appl. Ent. Zool. 18:545-549.

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. A. Wildl. Nat. Res. Conf 57:51-62.

Tietjen, H. P. 1976. Zinc phosphide - its development as a control agent for black-tailed prairie dogs. USDI, USFWS Spec. Sci. Rep. - Wildl. 195.

Tietjen, H. P., and G. H. Matscke. 1982. Aerial pre-baiting for management of prairie dogs with zinc phosphide. J. Wildl. Manage. 46:1108-1112.

Thorpe, J. 1996. Fatalities and destroyed civil aircraft due to bird strikes. 1912-1995. Proceedings of the International Bird Strike Conference 23:17-31

Tkadlec, E., and B. Rychnovsky. 1990. Residues of Zn_3P_2 in the common vole (*Microtus arvalis*) and secondary poisoning hazards to predators. Folia Zoologicia 39:147-156.

Tobin, M. E., P. P. Woronecki, R. A. Dolbeer, and R. L. Bruggers. 1988. Reflecting tape fails to protect ripening blueberries from bird damage. Wildl. Soc. Bull. 16:300-303.

Transport Canada. 1994. Wildlife Control Procedures Manual. Environment and Support Services, Safety and Technical Services, Airports Group, Transport Canada, Ottawa, Ontario. TP11500E.

Twedt, D.J., and J.F. Glahn. 1982. Reducing starling depredations at livestock feeding operations through changes in management practices. Proc. Vertebr. Pest Conf. 10:159-163.

USAF (U.S. Air Force), BASH web site 2005. http://afsafety.af.mil/afsc/bash/.

USDA (U. S. Department of Agriculture). 2003. Environmental Assessment: Reducing Pigeon, Starling, Sparrow, Blackbird, and Crow Damage through an Integrated Wildlife Damage Management Program in the State of Ohio. USDA, Animal and Plant Health Inspection Service, Wildlife Services, Reynoldsburg, Ohio.

USDA (U. S. Department of Agriculture). 2006. Environmental Assessment: Reducing Double-crested Cormorant Damage in Ohio. USDA, Animal and Plant Health Inspection Service, Wildlife Services, Reynoldsburg, Ohio.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control Program. 1997. Final Environmental Impact Statement - revised October 1997. USDA, APHIS, Wildlife Services Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

USFWS (U.S. Fish and Wildlife Service). 2006a. Trends in duck breeding populations, 1955-2006. U.S. Department of the Interior, Fish and Wildlife Service, Laurel, MD.

USFWS (U.S. Fish and Wildlife Service). 2006b. Migratory bird hunting activity and harvest during the 2004 and 2005 hunting seasons: Preliminary estimates. U.S. Department of the Interior, Washington, D.C. U.S.A.

USFWS (United States Fish and Wildlife Service). 2004. HARVEST INFORMATION PROGRAM: Preliminary Estimates of Waterfowl Hunter Activity and Harvest during the 2003 and 2004 Hunting Seasons. Administrative Report – July 2004. USFWS, Division of Migratory Bird Management, Harvest Surveys Section. Laurel, MD. 33pp.

Uresk, D. W., R. M. King, A. D. Apa, M. S. Deisch, and R. L. Linder. 1988. Rodenticidal effects of zinc phosphide and strychnine on nontarget species. Proc. Great Plains Damage Control Workshop. 8:57-63.

Vogt, P. F. 1997. Control of nuisance birds by fogging with ReJeX-iT TP-40. Proceedings of the Great Plains Wildlife Damage Control Workshop. 13:63-66.

Weber, W.J. 1979. Health Hazards from Pigeons, European starlings, and English Sparrows. Thompson Publications. Fresno, Calif. 138pp.

West, R.R. and J.F. Besser. 1976. Selection of toxic poultry pellets from cattle rations by starlings. Proc. Bird Control Semin. 7:242-244.

West, R.R., J.F. Besser and J.W. DeGrazio. 1967. Starling control in livestock feeding areas. Proc. Vertebr. Pest Conf. San Francisco, CA.

Williams, D.E. and R.M. Corrigan. 1994. Pigeons (Rock Doves) p. E-87 - E-96 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Wildlife Society, The. 1990. Conservation policies of the Wildlife Society. The Wildlife Society. Wash., D.C. 20pp.

Woronecki, P. P., R. A. Dolbeer, and T. W. Seamans. 1990. Use of alpha-chloralose to remove waterfowl from nuisance and damage situations. Proc. Vertbr. Pest Conf. 14:343-349.

Wright, E.N. 1973. Experiments to control starling damage at intensive animal husbandry units. Bull. OEPP. 9:85-89.

Wright, S.E. 2003. Some significant wildlife strikes to civil aircraft in the United States, 2001-January 2003. USDA APHIS WS NWRC Special Report. 16pp.

Appendix B

WILDLIFE DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATIONS BY THE OHIO WILDLIFE SERVICES PROGRAM

NON-LETHAL METHODS-NONCHEMICAL

Airfield management and property owner practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Airfield management or the property owner implements cultural methods and other management techniques. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practically. These methods include:

Environmental/Habitat modification can be an integral part of Wildlife Damage Management (WDM). Wildlife production and/or presence are directly related to the type, quality and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain wildlife species. Airports in Ohio are responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of WDM strategies at or near airports to reduce BASH problems by eliminating nesting, denning, roosting, loafing and feeding sites. Generally, many BASH problems on airport properties can be minimized through management of vegetation and water on areas adjacent to aircraft runways.

Animal Behavior Modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve us of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods are included in this category are:

Wildlife fence (Physical Exclusion)
Bird-proof barriers
Propane cannons
Pryotechnics
Distress Calls and sound producing devices
Chemical frightening agents
Repellents
Harassment with a radio controlled plane
Mylar tape

These methods are generally only practical for small area. Scaring devices such as distress calls, propane cannons, raptor effigies and silhouettes, mirrors and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota et al. 1983, Conover 1982, Arhart 1972).

Wildlife fence (Physical Exclusion) – A fence around the airfield could limit the entry of mammals onto the runway and taxiways. There are several types of fences that inhibit the movement of mammals onto the airfield area if properly installed including electric fencing, woven wire, and chain link fencing.

Bird-proof barriers can be effective but often are cost-prohibitive, particularly because of the aerial mobility of, which requires overhead barriers as well as peripheral fencing or netting. Building, hangers and display planes could be "bird proofed" using hardware cloth or netting, where feasible, to eliminate roosting and nesting areas. Porcupine wire (e.g., Nixalite™, Catclaw™) is a mechanical repellent method that can be used to exclude pigeons and other bird from ledges and other roosting surfaces (Williams and Coorigan 1994). The sharp points inflict temporary discomfort on the birds as they try to land, which deters them from roosting. Drawbacks of this method are that some pigeons have been know to build nests on top of porcupine wires and the method can be expensive to implement if large areas are involved. Electric shock bird control systems are available from commercial sources and, although expensive, can be effective in deterring pigeons and other birds from roosting on ledges, window sills

and other similar portions of structures (Williams and Corrigan 1994).

Auditory scaring devices such as propane cannons, pyrotechnics, electronic guards, sirens, scarecrows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Mott 1985, Shirota et al. 1983, and Arhart 1972). These methods should be reinforced with other scaring devices such as shooting and other types of physical harassment.

Visual techniques such as use of mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly gives birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, and Tobin et al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Physical harassment by radio controlled airplanes can be effective in some situations for dispersing damage-causing birds. This tool is effective in removing raptors from areas that are not accessible by other means. Radio controlled airplanes allow for up close and personal harassment of birds, while combining visual (eyespots painted on the wings) and auditory (engine noise and whistles attached to the aircraft) scare devices. Disadvantages of method are birds in large flocks do not respond to well the plane, training is required to become efficient, a good working relationship is required by the operator and air traffic controllers, weather conditions may restrict the ability/usefulness of the plane, and mechanical up keep.

Relocation of damaging birds or mammals to other areas following live capture generally would not be effective or cost-effective. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions for the relocation of damaging birds or mammals that might be a viable solution and acceptable to the public when the birds or mammals were considered to have high value such as migratory waterfowl, raptors, or T&E species. In these cases, WS would consult with the USFWS and/or ODNR to coordinate capture, transportation, and selection of suitable relocation sites, as well as compliance with all proper guidelines.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Live traps include:

When used as non-lethal methods, animals captured in live traps are relocated to locations designated by ODNR or the USFWS as appropriate.

> **Clover, funnel, and common pigeon traps** are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS' standard procedure when conducting pigeon trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked daily, every other day, or as

appropriate, to replenish bait and water and to remove captured birds.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Mist nets are more commonly used for capturing small-sized birds such as house sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping "pockets" in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture**.**

Swedish Goshawk traps are large cage type traps used for catching large birds of prey such as hawks and owls. These traps are two part traps with live bait (pigeons, rabbits, or starlings) placed in the lower section. The birds of prey are captured, when then investigate the prey and perch on the trigger bar causing them to fall into the upper portions of the trap, which closes around the bird.

Bal-chatri traps are small traps used for capturing birds of prey such as hawks and owls. Live bait such as pigeons, starlings, rodents, etc. are used to lure raptors into landing on the trap (Hygnstrom and Craven 1994) where nylon nooses entangle their feet and hold the bird. The trap is made of chicken wire or other wire mesh material which is formed into a Quonset hut-shaped cage that holds the live bait. The outside top and sides are covered with many nooses consisting of strong monofilament line or stiff nylon string.

Leghold traps are small traps that come in a variety of sizes that allows the traps to be species specific of some degree. These traps are used for both mammals and birds and can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws, which hold the animal.

Cage traps are live capture traps used to trap a variety of small to medium sized mammals. Cage traps come in a variety of sizes, are made of galvanized wire mesh, and consist of a treadle in the middle of the cage that triggers the door to close behind the animal being trapped.

Sherman box traps are small live traps used to capture small mammals such as rodents. These traps are often made of galvanized steel or aluminum and fold up for easy transport. Sherman box traps also consist of a treadle towards the back of the trap that triggers the door to close behind the animal being trapped.

Leghold traps are small traps that come in a variety of sizes that allows the traps to be species of some degree. These traps are used for both mammals and birds and can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws which hold the animal.

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the snare the loop becomes smaller in size, holding the animal as if it were on a leash. Many snares are equipped with integrated stops that permit snaring, but do not choke the animal.

Bow nets are small circular net traps used for capturing birds and small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord

Hand nets are used to catch birds and small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles.

Net guns are devices used to trap birds and mammals. The devices project a net over at target using a specialized gun.

NON-LETHAL METHODS – CHEMICAL

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl (Dolbeer et al. 1993). Methyl anthranilate (MA) is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et al. 1984; 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[5]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[4]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb. with retreating required every 3-4 weeks (RJ Advantage, Inc. 1997). An example of the level of expense involved is a golf course in Rio Rancho, NM where it was estimated that treating four watercourse areas would cost in excess of $25,000 per treatment for material alone. Cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water (RJ Advantage, Inc. 1997) which indicates the repellent effect is short-lived.

Another potentially more cost effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site (Dr. P. Vogt, RJ Advantage, Inc., pers. comm. 1997). Applied at a rate of about .25 lb./ acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by U.S. Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA).

[3] An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or in this case, in micrograms per individual bee, required to cause death in 50% of a test population of a species.
[4] An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, starlings rejected grain to which charcoal particles were adhered (L. Clark, National Wildlife Research Center, pers. comm. 1999). If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, pers. comm. 1999).

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). This chemical is not yet registered in the U.S. but may become available at some future date. Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting starlings (Clark 1997). Naphthalene (moth balls) was found to be ineffective in repelling starlings (Dolbeer et al. 1998).

Tactile repellents. A number of tactile repellent products are on the market, which reportedly deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason et al. 1989). The repellency of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well-contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1997 Revised) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bio-accumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, nontarget species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. Alpha chloralose is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telezol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999). This drug is sold in a powder form and

must be reconstituted with sterile water before use. Once mixed with sterile water, the shelf life is four days at room temperature and 14 days if refrigerated.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

LETHAL METHODS – NON-CHEMICAL

Conibear (Body Gripping) Traps are the steel framed traps used to capture and quickly kill aquatic mammals. These traps come in a variety of sizes and may be used on land or in the water depending on size and state and local laws. The traps are made of two steel square frames that are hinged on two sides and have one or two springs.

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally shooting is conducted with shotguns or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997 Revised). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire firearms is sometimes used to manage bird and mammal damage problems when lethal methods are determined to be appropriate. The birds and animals are killed as quickly and humanely as possible. WS follows all firearm safety precautions when conducting WDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport Hunting and regulated trapping is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted, and activities can meet airport security and safety compliance. A valid hunting license, Fur Taker Permit and other licenses or permits may be required by the Ohio Department of Natural Resources (ODNR) and USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for pigeon damage management White-tailed deer, Canada geese, and other damage causing waterfowl.

Snap traps are used to remove small rodents and may be modified to remove individual woodpeckers, starlings, and other cavity use birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area. These traps pose no imminent danger to pets or the public.

Cervical dislocation is sometimes used to euthanize small rodents and birds which are captured in live traps and when relocation is not a feasible option. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of small rodents, poultry and other small birds (Beaver et al 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al 2001).

Egg addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see *Egg oiling* below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has shown to be effective.

Live traps include all the methods listed above under non-lethal – non-chemical. When used as lethal technique, all animals captured would be euthanized instead of released.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and administered by the EPA and the Ohio Department of Agriculture (ODA), Pesticide Regulation. All WS personnel in Ohio that use pesticides are certified as restricted-use pesticide applicators by ODA, Pesticide Regulation; which requires pesticide applicators to adhere to all certification requirements set forth in the FIFRA. Chemicals are only used on private, public, or tribal property sites with authorization from the land management agency or the property owner or manager.

Alpha-chloralose is described above under "non-lethal – chemical". When used as a lethal WDM technique, captured animals are euthanized instead of released.

Egg oiling is method of suppressing reproduction of nuisance birds by spraying a small quantity of mineral oil or food grade corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability. (Pochop 1998; Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not re-nest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

CO_2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339 is the principal chemical method that would be used for starling/blackbird and pigeon damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals. For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to nontarget and T&E species (USDA 1997 Revised). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997 Revised). Appendix P of USDA (1997 Revised) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

DRC-1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the BDM project.

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Pre-baiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, starlings, and house sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding. Usually, a few birds will consume the treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies have demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water. It is non-accumulative in tissues and is rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species; however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the GI tract of affected or dead birds (Holler and Shafer 1982, Schafer 1981). A formal Risk Assessment found no probable risk is expected for

pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997 Revised, Appendix P).

Zinc Phosphide, at concentrations of 0.75% to 2.0% on grain, fruit, or vegetable baits, has been used successfully against such species as meadow mice, ground squirrels, prairie dogs, Norway rats, Polynesian rats, cotton rats and nutria. Zinc phosphide is a heavy, finely ground gray-black powder that is partially insoluble in water and alcohol. When exposed to moisture, it decomposes slowly and releases phosphine gas (PH_3). Phospine, which is highly flammable, may be generated rapidly if the material comes in contact with dilute acids. Zinc phosphide concentrate is a stable material when kept dry and hermetically sealed.

Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. For many uses of zinc phosphide formulated on grain or grain-based baits, pre-baiting is recommended or necessary for achieving good bait acceptance.

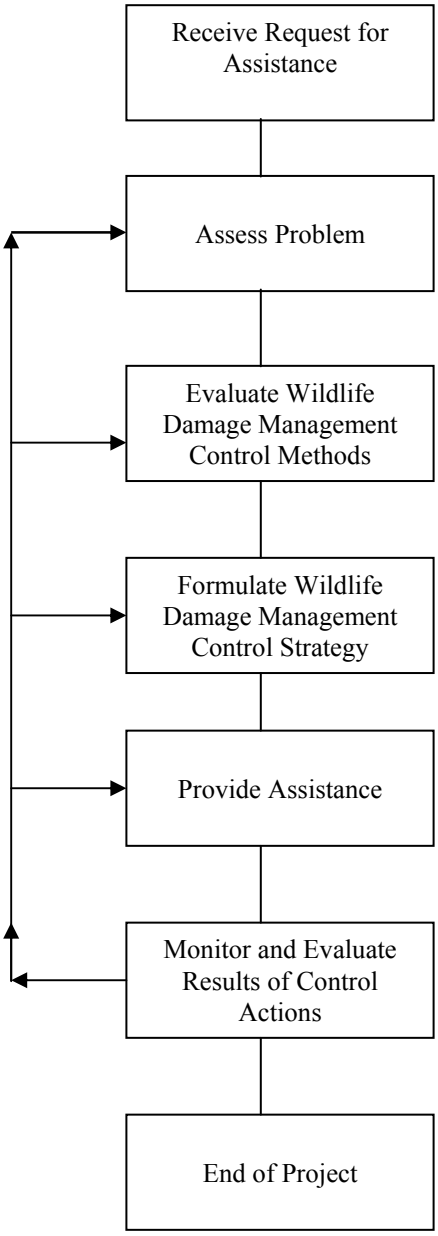
When zinc phosphide comes into contact with dilute acids in the stomach, phosphate (PH3) is released. It is this substance that probably caused death. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication that occurs is similar to intoxication with yellow phosphorous, in which the liver is heavily damaged. Prolonged exposure to phosphine can produce chronic phosphorous poisoning.

Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is no secondary poisoning with this rodenticide. The bait however, remains toxic up to several days in the gut of the dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.

Anticoagulant Rodenticides. Several anticoagulant rodenticides are used to control commensal rodents and some field rodents around building and other structures. Common anticoagulants include warfarin and diphacinone. Anticoagulants are normally classified as multiple-dose toxicants. For the materials to be effective, animals must feed on the bait more than once. However, some newer formulations only require a single feeding to e effective. Bait for rats and mice must be continuously available for 2 to 3 weeks for effective population control.

Appendix C

WILDIFE SERVICES DECISION MAKING MODEL



APPENDIX D

**UNITED STATES DEPARMENT OF THE INTERIOR,
FISH AND WILDLIFE SERVICE'S LIST OF
ENDANGERED, THREATENED, PROPOSED & CANDIDATE SPECIES, AND SPECIES OF CONCERN
IN OHIO**

ENDANGERED

Animals

Indiana bat	*Myotis sodalis*
American burying beetle	*Nicrophorus americanus*
Karner blue butterfly	*Lycaeides melissa samuelis*
Mitchell's satyr butterfly	*Neonympha mitchellii mitchellii*
Purple cat's paw pearly mussel	*Epioblasma obliquata obliquata*
White cat's paw pearly mussel	*Epioblasma obliquata perobliqua*
Clubshell mussel	*Pleurobema clava*
Fanshell mussel	*Cyprogenia stegaria*
Scioto madtom	*Noturus trautmani*
Pink mucket pearly mussel	*Lampsilis abrupta*
Piping plover	*Charadrius melodus*
Northern riffleshell mussel	*Epioblasma torulosa rangiana*

Plants

Running buffalo clover	Trifolium stoloniferum

THREATENED

Animals

Bald eagle	*Haliaeetus leucocephalus*
Copperbelly water snake	*Nerodia erythrogaster neglecta*
Lake Erie water snake	*Nerodia sipedon insularum*

Plants

Northern monkshood	*Aconitum noveboracense*
Lakeside daisy	*Hymenoxys herbacea*
Small whorled pogonia	*Isotria medeoloides*
Eastern prairie fringed orchid	*Platanthera leucophaea*
Virginia spiraea	*Spiraea virginiana*

PROPOSED AND CANDIDATE SPECIES*

Animals

Eastern massasauga	*Sistrurus catenatus*
Timber rattlesnake	*Crotalus horridus horridus*

SPECIES OF CONCERN**

Animals

Eastern small-footed bat	*Myotis subulatus leibii*
Alleghany woodrat	*Neotoma floridana magister*
Rafinesque's (southeastern) big-eared bat	*Plecotus rafinesquii*
Appalachian bewick's wren	*Thryomanes bewickii altus*

Bachman's sparrow	*Aimophila aestivalis*
Black rail	*Laterallus jamaicensis*
Black tern	*Chlidonias niger*
Cerulean warbler (CE)	*Dendroica cerulean*
Common tern	*Sterna hirundo*
Henslow's sparrow	*Ammodramus henslowii*
Loggerhead shrike	*Lanius ludovicianus*
Northern goshawk	*Accipiter gentiles*
Peregrine falcon (M)	*Falco peregrinus*
Blanding's turtle	*Emydoidea blandingii*
Timber rattlesnake (PC)	*Crotalus horridus horridus*
False map turtle	*Graptemys pseudogeographica*
Hellbender (CE)	*Crytobranchus alleganiensis*
Kirtland's snake	*Clonophis kirtlandii*
Shorthead garter snake	*Thamnohis brachystoma*
Crystal darter (CE)	*Crystallaria asprella*
Eastern sand darter (CE)	*Etheostoma pellucidum*
Spotted darter (CE)	*Etheostoma maculatum*
Longhead darter (CE)	*Percina macrocephala*
Blue sucker	*Cycleptus elongates*
Greater redhorse	*Moxostoma valenciennesi*
Lake sturgeon	*Acipenser fulvescens*
Paddlefish	*Polydon spathula*
Elktoe mussel	*Alasmidonta marginata*
Pink (pyramid) pigtoe	*Pleurobema pyramidatum*
Purple lilliput mussel	*Toxolasma lividus*
Rabbitsfoot mussel (CE)	*Quadrula cylindrica cylindrica*
Rayed bean mussel (CE)	*Villosa fabalis*
Salamander mussel	*Simpsonaias ambigua*
Sheepnose mussel (CE)	*Plethobasus cyphyus*
Snuffbox mussel (CE)	*Epioblasma triquetra*
Varicose rocksnail	*Lithasia verrucosa*
Albarufan dager moth	*Acronicta albaruta*
Black lordithon rove beetle	*Lordithon niger*
Cobblestone tiger beetle	*Cicindela marginipennis*
Diana fritillary	*Speyeria diana*
Elusive clubtail dragonfly	*Gomphus notatus*
Grizzled skipper	*Pyrgus wyandot*
Hebard's noctuid moth	*Erythroecia hebardi*
Kramer's cave beetle	*Pseudanophthalmus krameri*
Laricis tree cricket	*Oecanthus laricis*
Looper moth	*Euchlaena milnei*
Ohio cave beetle	*Pseudanophthalmus ohioensis*
Precious underwing moth	*Catocala pretiosa*
Regal fritillary	*Speyeria idalia*
Sixbanded longhorn beetle	*Dryobius sexnotatus*
Wabash belted skimmer dragonfly	*Macromia wabashensis*
Fern Cave isopod	*Caecidotea filicispeluncae*
Frost Cave isopod	*Caecidotea rotunda*

Plants

Appalachian oak fern	*Gymnocarpium appalachianum*
Bartley's reed bent grass (aka Ofer Hollow reed grass)	*Calamagrostis porteri spp. insperata*
Bog bluegrass (aka marsh speargrass)	*Poa paludigena*

Butternut tree	*Juglans cinerea*
Cliff-green	*Paxistima canbyi*
Cooper's milk-vetch	*Astragalus neglectus*
Ear-leaf foxglove	*Tomanthera auriculata*
Glade spurge	*Euphorbia purpurea*
Juniper sedge (CE)	*Carex juniperorum*
Lake-cress	*Armoracia lacustris*
Purple wood sedge	*Carex purpurifera*
Sand sumac (aka beach sumac)	*Rhus aromatica var. arenaria*
Sedge (aka "handsome sedge")	*Carex formosa*
Skinner's foxglove	*Tomanthera skinneriana*
Tall larkspur	*Delphinium exaltatum*
Wolf's spikerush	*Eleocharis wolfii*

SYMBOLS KEY

CE = Currently under evaluation for Federal candidate status
M = Active monitoring (recovery, threats, population status, etc.)
*Federal pre-listing conservation plan exists or is being developed for these species.

**Important notes:

1. Please contact the State of Ohio (ODNR Division of Wildlife; and ODNR Division of Natural Areas and Preserves) to learn the state status of the species shown.

2. This is an unofficial list of species of concern to the U.S. Fish and Wildlife Service that occur in Ohio. Similar lists printed during the 1990's were formerly called "Other Species Being Monitored".

Appendix E

**OHIO DEPARTMENT OF NATURAL RESOURCES,
DIVISION OF WILDLIFE'S
LIST OF WILDLIFE SPECIES THAT ARE CONSIDERED TO BE ENDANGERED, THREATENED, SPECIES OF CONCERN, OR SPECIAL INTEREST IN OHIO**

ENDANGERED

Mammals

Indiana myotis	*Myotis sodalis*
Allegheny woodrat	*Neotoma magister*
Bobcat	*Felis rufus*
Black bear	*Ursus americanus*
Snowshoe hare	*Lepus americanus*

Birds

American bittern	*Botaurus lentiginosus*
Bald eagle	*Haliaeetus leucocephalus*
Northern harrier	*Circus cyaneus*
Peregrine falcon	*Falco peregrinus*
King rail	*Rallus elegans*
Sandhill crane	*Grus canadensis*
Piping plover	*Charadrius melodus*
Common tern	*Sterna hirundo*
Black tern	*Chlidonias niger*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Loggerhead shrike	*Lanius ludovicianus*
Golden-winged warbler	*Vermivora chrysoptera*
Kirtland's warbler	*Dendroica kirtlandii*
Lark sparrow	*Chondestes grammacus*
Osprey	*Pandion haliaetus*
Trumpeter swan	*Cygnus buccinator*
Snowy egret	*Egretta thula*
Cattle egret	*Bubulcus ibis*

Reptiles

Copperbelly water snake	*Nerodia erythrogaster neglecta*
Eastern plains garter snake	*Thamnophis radix radix*
Timber rattlesnake	*Crotalus horridus horridus*
Eastern massasauga	*Sistrurus catenatus*
Lake Erie water snake	*Nerodia sipedon insularum*

Amphibians

Eastern hellbender	*Cryptobranchus alleganiensis alleganiensis*
Blue-spotted salamander	*Ambystoma laterale*
Green salamander	*Aneides aeneus*
Cave salamander	*Eurycea lucifuga*
Eastern spadefoot	*Scaphiopus holbrookii*

Fishes

Ohio lamprey	*Ichthyomyzon bdellium*

Northern brook lamprey	*Ichthyomyzon fossor*
Mountain brook lamprey	*Ichthyomyzon greeleyi*
Lake sturgeon	*Acipenser fulvescens*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Spotted gar	*Lepisosteus oculatus*
Shortnose gar	*Lepisosteus platostomus*
Cisco (Lake herring)	*Coregonus atedi*
Goldeye	*Hiodon alosoides*
Speckled chub	*Macrhybopsis aestivalis*
Pugnose minnow	*Opsopoeodus emiliae*
Popeye shiner	*Notropis ariomus*
Blackchin shiner	*Notropis heterodon*
Blacknose shiner	*Notropis heterolepis*
Mississippi silvery minnow	*Hybognathus nuchalis*
Blue sucker	*Cycleptus elongatus*
Longnose sucker	*Catostomus catostomus*
Blue catfish	*Ictalurus furcatus*
Mountain madtom	*Noturus eleutherus*
Northern madtom	*Noturus stigmosus*
Scioto madtom	*Noturus trautmani*
Pirate perch	*Aphredoderus sayanus*
Western banded killifish	*Fundulus diaphanus menona*
Spotted darter	*Etheostoma maculatum*

Mollusks

Snuffbox	*Epioblasma triquetra*
Ebonyshell	*Fusconaia ebena*
Fanshell	*Cyprogenia stegaria*
Butterfly	*Ellipsaria lineolata*
Elephant-ear	*Elliptio crassidens crassidens*
Purple catspaw	*Epioblasma obliquata obliquata*
White catspaw	*Epioblasma obliquata perobliqua*
Northern riffleshell	*Epioblasma torulosa rangiana*
Long-solid	*Fusconaia maculata maculata*
Pink mucket	*Lampsilis orbiculata*
Sharp-ridged pocketbook	*Lampsilis ovata*
Yellow sandshell	*Lampsilis teres*
Eastern pondmussel	*Ligumia nasuta*
Washboard	*Megalonaias nervosa*
Sheepnose	*Plethobasus cyphyus*
Clubshell	*Pleurobema clava*
Ohio pigtoe	*Pleurobema cordatum*
Pyramid pigtoe	*Pleurobema rubrum*
Rabbitsfoot	*Quadrula cylindrica cylindrica*
Monkeyface	*Quadrula metanevra*
Wartyback	*Quadrula nodulata*
Purple lilliput	*Toxolasma lividus*
Rayed bean	*Villosa fabalis*
Little spectaclecase	*Villosa lienosa*

Dragonflies

Hine's emerald	*Somatochlora hineana*
Mottled darner	*Aeshna clepsydra*
Plains clubtail	*Gomphurus externus*

American emerald	*Cordulia shurtleffi*
Uhler's sundragon	*Helocordulia uhleri*
Frosted whiteface	*Leucorrhinia frigida*
Elfin skimmer	*Nannothemis bella*
Canada darner	*Aeshner canadensis*
Racket-tailed emerald	*Dorocordulia libera*
Brush-tipped emerald	*Somatochlora walshii*
Blue corporal	*Ladona deplanata*
Chalk-fronted corporal	*Ladona Julia*
Yellow-sided skimmer	*Libellula flavida*
Damselflies	
Lilypad forktail	*Ischnura kellicotti*
Seepage dancer	*Argia bipunctulata*
Caddisflies	
	Chimarra social
	Oecetis eddlestoni
	Brachycentrus numerosus
Mayflies	
	Rhithrogena pellucida
	Litobrancha recurvata
Butterflies	
Persius dusky wing	*Erynnis persius*
Frosted elfin	*Incisalia irus*
Karner blue	*Lycaeides melissa samuelis*
Purplish copper	*Lycaena helloides*
Swamp metalmark	*Calephelis muticum*
Regal fritillary	*Speyeria idalia*
Mitchellis satyr	*Neonympha mitchellii*
Moths	
Unexpected cycnia	*Cycnia inopinatus*
Graceful underwing	*Catocala gracilis*
	Spartiniphaga inops
	Hypocoena enervata
	Papaipema silphii
	Papaipema beeriana
	Lithophane semiusta
	Trichoclea artesta
	Tricholita notata
	Melanchra assimilis
Pointed sallow	*Epiglaea apiata*
	Ufeus plicatus
	Ufeus satyricus
Hebard's noctuid moth	*Erythroecia hebardi*
Beetles	
Kramer's cave beetle	*Pseudanophthalmus krameri*
Ohio cave beetle	*Pseudanophthalmus ohioensis*
American burying beetle	*Nicrophorus americanus*

THREATENED

Birds	
Upland sandpiper	*Bartramia longicauda*
Black-crowned night-heron	*Nycticorax nycticorax*
Yellow-crowned night-heron	*Nyctanassa violacea*
Barn owl	*Tyto alba*
Dark-eyed junco	*Junco hyemalis*
Hermit thrush	*Catharus guttatus*
Least bittern	*Ixobrychus exilis*
Least flycatcher	*Empidonax minimus*
Reptiles	
Kirtland's snake	*Clonophis kirtlandii*
Spotted turtle	*Clemmys guttata*
Amphibians	
Mud salamander	*Pseudotriton montanus*
Fishes	
Brook trout	*Salvelinus fontinalis*
Bigeye shiner	*Notropis boops*
Tonguetied minnow	*Exoglossum laurae*
Greater redhorse	*Moxostoma valenciennesi*
Channel darter	*Percina copelandi*
American eel	*Anguilla rostrata*
Paddlefish	*Polyodon spathula*
Rosyside dace	*Clinostomus funduloides*
Bigmouth shiner	*Notropis dorsalis*
Lake chubsucker	*Erimyzon sucetta*
River darter	*Etheostoma camurum*
Bluebreast darter	*Etheostoma camurum*
Tippecanoe darter	*Etheostoma tippecanoe*
Mollusks	
Black sandshell	*Ligumia recta*
Threehorn wartyback	*Obliquaria reflexa*
Fawnsfoot	*Truncilla donaciformis*
Pondhorn	*Uniomerus tetralasmus*
Crayfishes	
Sloan's crayfish	*Orconectes sloanii*
Dragonflies	
Riffle snaketail	*Ophiogomphus carolus*
Damselflies	
River jewelwing	*Calopteryx aequabilis*
Caddisflies	
	Psilotreta indecisa
	Hydroptila albicornis
	Hydroptila artesa
	Hydroptila koryaki

	Hydroptila talledaga
	Hydroptila Valhalla
Midges	
	Bethbilbeckia floridensis
	Apsectrotanypus johnsoni
	Radotanypus florens
Butterflies	
Silver-bordered fritillary	*Boloria selene*
Moths	
Wayward nymph	*Catocala antinympha*
	Spartiniphaga panatela
	Fagitana littera
The pink-streak	*Faronta rubripennis*
Beetles	
	Cicindela hirticollis
Cobblestone tiger beetle	*Cicindela marginipennis*

SPECIES OF CONCERN

Mammals	
Pygmy shrew	*Sorex hoyi*
Star-nosed mole	*Condylura cristata*
Eastern small-footed bat	*Myotis subulatus*
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*
Southern red-backed vole	*Clethrionomys gapperi*
Woodland jumping mouse	*Napaeozapus insignis*
Badger	*Taxidea taxus*
Ermine	*Mustela erminea*
Birds	
Sharp-shinned hawk	*Accipiter striatus*
Sedge wren	*Cistothorus platensis*
Marsh wren	*Cistothorus palustris*
Henslow's sparrow	*Ammodramus henslowii*
Cerulean warbler	*Dendroica cerulea*
Prothonotary warbler	*Protonotaria citrea*
Black vulture	*Coragyps atratus*
Bobolink	*Dolichonyx oryzivorus*
Northern bobwhite	*Colinus virginianus*
Common moorhen	*Gallinula chloropus*
Great egret	*Casmerodius albus*
Sora rail	*Porzana Carolina*
Virginia rail	*Rallus limicola*
Mollusks	
Flat floater	*Anodonta suborbiculata*
Purple wartyback	*Cyclonaias tuberculata*
Wavy-rayed lampmussel	*Lampsilis fasciola*
Round pig-toe	*Pleurobema sintoxia*
Salamander mussel	*Simpsonaias ambigua*

Deertoe	*Truncilla truncate*
Elktoe	*Alasmidonta marginata*
Kidneyshell	*Ptychobranchus fasciolaris*
Creek heelsplitter	*Lasmigona compressa*
Reptiles	
Eastern box turtle	*Carolina carolina*
Blanding's turtle	*Emydoidea blandingii*
False map turtle	*Graptemys pseudogeographica*
Coal skink	*Eumeces anthracinus*
Black king snake	*Lampropeltis getula nigra*
Eastern garter snake (melanistic)	*Thamnophis sirtalis sirtalis*
Rough green snake	*Opheodrys aestivus*
Eastern fox snake	*Elaphe vulpina gloydi*
Amphibians	
Four-toed salamander	*Hemidactylium scutatum*
Fishes	
Lake trout	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Burbot	*Lota lota*
Muskellunge	*Esox masquinongy*
River redhorse	*Moxostoma carinatum*
Eastern sand darter	*Ammocrypta pellucida*
Least darter	*Etheostoma microperca*
Iowa darter	*Etheostoma exile*
Spoonhead sculpin	*Cottus ricei*
Crayfishes	
Great Lakes crayfish	*Orconectes propinquus*
Northern crayfish	*Orconectes virilis*
Dragonflies	
Tiger spiketail	*Cordulegaster erronea*
Mayflies	
	Stenonema ithica
Midges	
	Cantopelopia gesta
Caddisflies	
	Hydroptila Chattanooga
	Asynarchus montanus
	Nemotaulius hostilis
Butterflies	
Two-spotted skipper	*Euphyes bimacula*
Grizzled skipper	*Pyrgus centaureae wyandot*
Moths	
Looper moth	*Euchlaena milnei*
Buck moth	*Hemileuca maia*

One-eyed sphinx	*Smerinthus cerisyi*
Slender clearwing	*Hemaris gracilis*
Precious underwing	*Catocala pretiosa*
	Macrochilo bivittata
	Phalaenostola hanhami
	Paectes abrostolella
	Capis curvata
	Tarachidia binocula
	Apamea mixta
	Agroperina lutosa
Columbine borer	*Papaipema leucostigma*
Bracken borer moth	*Papaipema pterisii*
Osmunda borer moth	*Papaipema speciosissima*
	Chytonix sensilis
	Amolita roseola
Goat sallow	*Homoglaea hircina*
	Brachylomia algens
Purple arches	*Polia purpurissata*
Scurfy quaker	*Homorthodes furfurata furfurata*
	Trichosilia manifesta
	Euchlaena milnei
	Agonopterix pteleae

Beetles

Six-banded longhorn beetle	*Dryobius sexnotatus*
	Cicindela splendida
	Cicindela ancocisconensis
	Cicindela cursitans
	Cicindela cuprascens
	Cicindela macra

Isopods

Fern cave isopod	*Caecidotea filicispeluncae*
Frost cave isopod	*Caecidotea rotunda*

Pseudoscorpions

Buckskin cave	*Apochthonius hobbsi*

Crickets

Laricis tree cricket	*Oecanthus laricis*

SPECIAL INTEREST

Birds

Canada warbler	*Wilsonia canadensis*
Little blue heron	*Egretta caerulea*
Magnolia warbler	*Dendroica magnolia*
Northern waterthrush	*Seiurus noveboracensis*
Winter wren	*Troglodytes troglodytes*
Black-throated blue warbler	*Dendroica caerulescens*
Brown creeper	*Certhia americana*
Chuck-will's-widow	*Caprimulgus carolinensis*
Bell's vireo	*Vireo bellii*
Long-eared owl	*Asio otus*

Mourning warbler	*Oporornis philadelphia*
Northern saw-whet owl	*Aegolius acadicus*
Pine siskin	*Carduelis pinus*
Purple finch	*Carpodacus purpureus*
Red-breasted nuthatch	*Sitta canadensis*
Short-eared owl	*Asio flammeus*
Western meadowlark	*Sturnella neglecta*
Golden-crowned kinglet	*Regulus satrapa*
Blackburnian warbler	*Dendroica fusca*
Blue grosbeak	*Guiraca caerulea*
Common snipe	*Gallinago gallinago*
American wigeon	*Anas americana*
Gadwall	*Anas strepera*
Green-winged teal	*Anas crecca*
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Redhead duck	*Aythya americana*
Ruddy duck	*Oxyura jamaicensis*
Wilson's phalarope	*Phalaropus tricolor*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*

Butterflies

Olympia marblewing	*Euchloe Olympia*

Moths

Slender clearwing	*Hemaris gracilis*
	Sphinx lucitiosa
	Tathorhynchus exsiccatus
	Catocala marmorata
Subflava sedge borer moth	*Archanara subflava*
	Caradrina meralis
	Calophasia lunula
	Leucania insueta
	Protorthodes incincta

Appendix F

LIST OF REVIEWERS AND PREPARERS, AND PERSONS CONSULTED

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